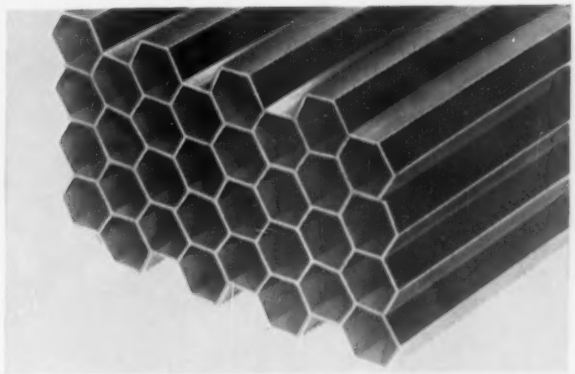
News about

B.F.Goodrich Chemical *raw materials*

*blister resistant Hycar

*new compounds meet industrial specs



One of the new applications of Hycar American Rubber is this honeycomb which is multiple extruded and used as a spring core for freight car journal box lubricators. A unique rubber product, it has exceptional radial spring, axial stiffness and stability of shape and dimension. It withstands temperature extremes, oil immersion and abrasion.

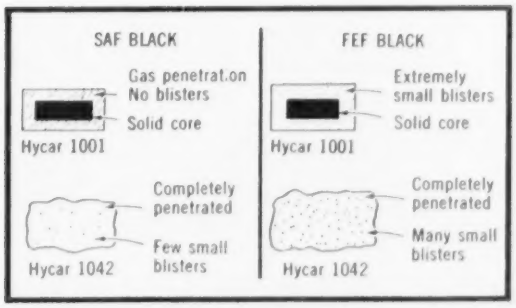
Blister resistant Hycar for high pressure gas service. A new, extremely strong and blister resistant Hycar compound — 1001/SAF — has been developed specifically for making sleeves and diaphragms used in high pressure regulators for the oil and gas industry. Ordinary rubbers proved unsatisfactory because they did not have high oil resistance combined with physical strength to reduce oil and gas penetration; and the ability to withstand internal pressures from entrapped gases after flow pressures up to 3000 psi were removed. This pressure removal often caused severe swelling or complete rupture of parts made from ordinary rubber. Following tests on various Hycar compounds, these conclusions were reached:

(1) High acrylonitrile Hycar polymers perform best.

(2) Loading with fine particle size blacks give highest blister resistance. SAF black provides the best results.

(3) Plasticizers increase blistering. Extractable types are especially bad. Small amounts of non-extractable plasticizer can be used as a processing aid.

(4) The curing system is not important as long as a tight cure is obtained.



Cross sections of several polymers were made after one week's exposure to 100 psi carbon dioxide and 600 psi ethylene. These sections clearly show the superior blister resistance of high acrylonitrile Hycar 1001 and the better performance achieved through SAF Black Loading. Base recipe for this test: Hycar polymers 100.0; Zinc oxide 5.0; Black loading 40.0; TMTD 3.5; Stearic Acid 1.0.

NEW HYCAR COMPOUNDS FOR INDUSTRIAL SPECIFICATIONS

Bendix-Westinghouse Spec 1036-M . . . requiring very low volume change after immersion in ASTM No. 1 and No. 3 oils and satisfactory performance at −40°F. Primary uses: valves and valve seats. *Hycar 1042 compound.*

Military Spec MIL-G-1086A . . . requiring resistance to aviation gasoline, water and asphalt. For gaskets on bolted steel storage tanks. *Hycar 1042 compounds.*

Allison Proposed Spec 22619 . . . requiring a 90±5 Durometer A compound with excellent oil resistance at high temperatures. Two Hycar 1042 compounds meet the spec.

Automotive Spec No. 69 . . . requiring a 70±5 Durometer A compound, good oil resistance and ability to withstand temperature extremes. Applications: lip-type seals and other automotive seals. A Hycar 1042 compound has narrow volume change limits after aging in ASTM No. 1 oil at 300°F; and −15°F low temperature brittleness.

For further information on Hycar nitrile rubber, write Dept. HO-5, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ont.

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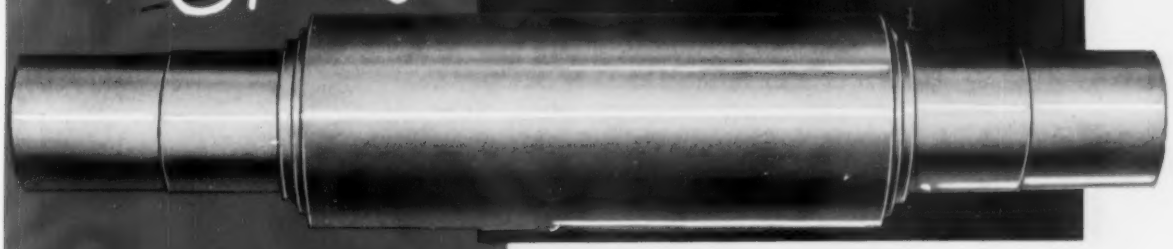

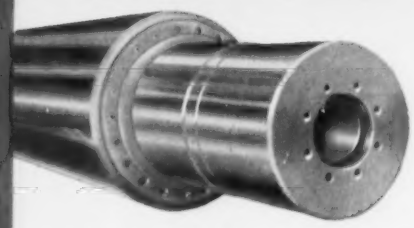

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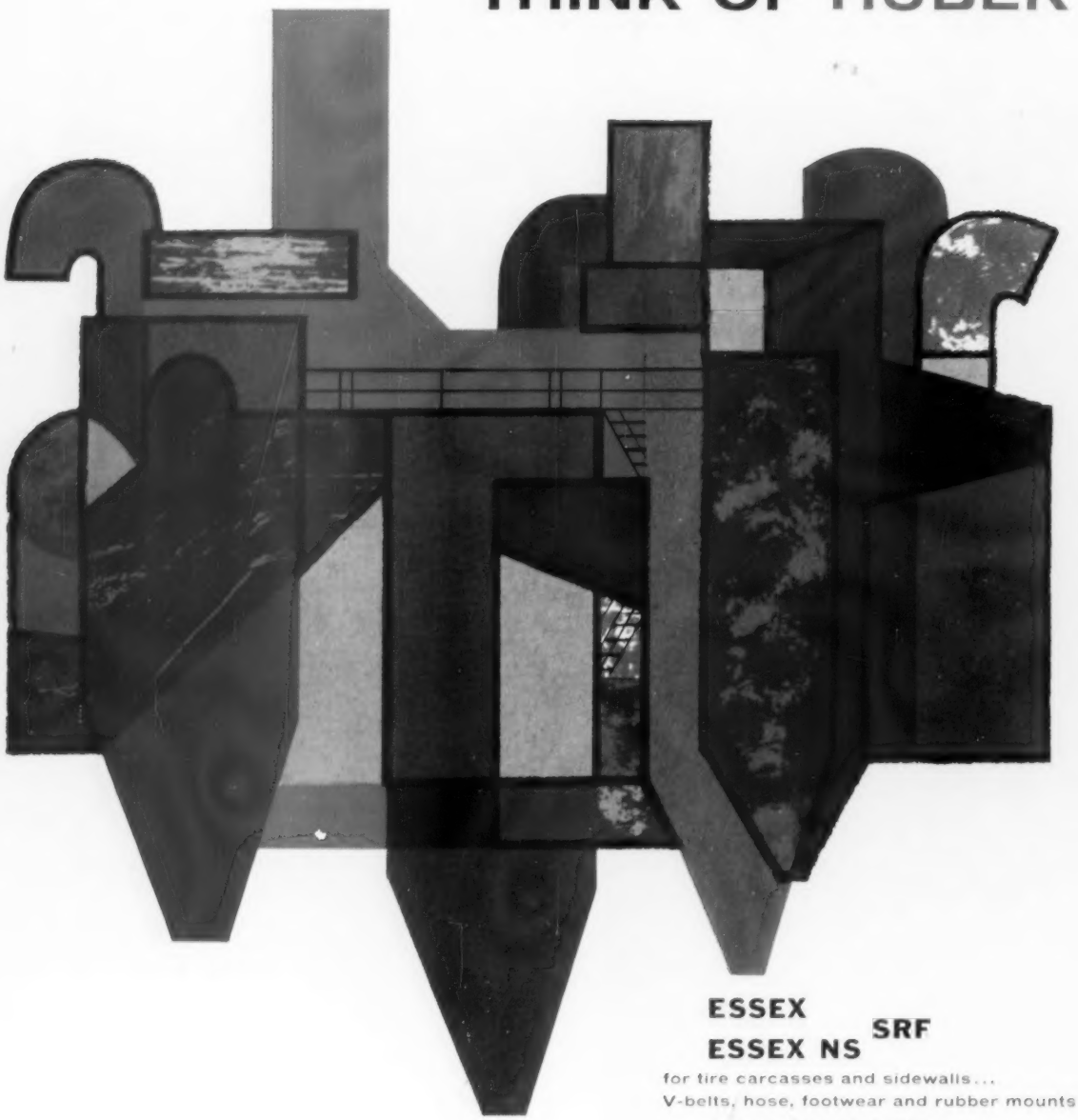

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Rubber Age

COVERING THE MANUFACTURE OF RUBBER AND RUBBERLIKE PLASTICS PRODUCTS

MAY, 1957 VOL. 81 NO. 2

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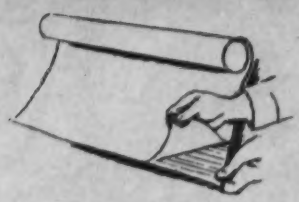

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Letters to the editor

Re Suggested Society

In the March, 1957, issue of RUBBER AGE, *there appeared a letter from W.J.R. Hauser which set forth reasons on the need for a new practical manufacturing society for rubber technologists. Mr. Hauser expressed the belief that while the present technical groups perform a valuable service, they are primarily concerned with theory and research rather than with manufacturing and elastomer use. The letters which appear below offer some comments on this problem.*

EDITOR

Dear Sir:

At present I find myself on the side of disagreeing with Mr. Hauser. Being faced with more societies than I can assimilate, it seems that a new one is unnecessary. Understandably, the American Chemical Society publications are more technical in their approach, omitting the practical aspects of processing. However, it seems that . . . journals such as RUBBER AGE offer an adequate form for presenting this point of view.

R. L. BEBB
Firestone Tire & Rubber Co.,
Akron, Ohio

. . . It is my opinion that the Division of Rubber Chemistry, A.C.S., functions adequately for my needs . . .

ALEX SACHER
Standard Insulation Co.,
East Rutherford, N. J.

. . . We would not be interested in participating.

HARRY J. HOFFMAN
Avery Adhesive Label Corp.,
Monrovia, Calif.

. . . Will agree with Mr. Hauser that there is a need for the group he suggests. There is, however, a problem in that we belong to so many societies that another organization might complicate matters.

F. L. STRANG
Providence, R. I.

. . . Rather than a new society, perhaps we ought to reorganize one of the current groups. If I were to attend all society meetings I wouldn't have time for normal business activities.

NAME WITHHELD

Memo from the Editor

The "Letters to the Editor" columns are open to all of our readers and we invite comments for publication. Address: Editor, RUBBER AGE, 101 West 31st St., New York 1, N. Y.

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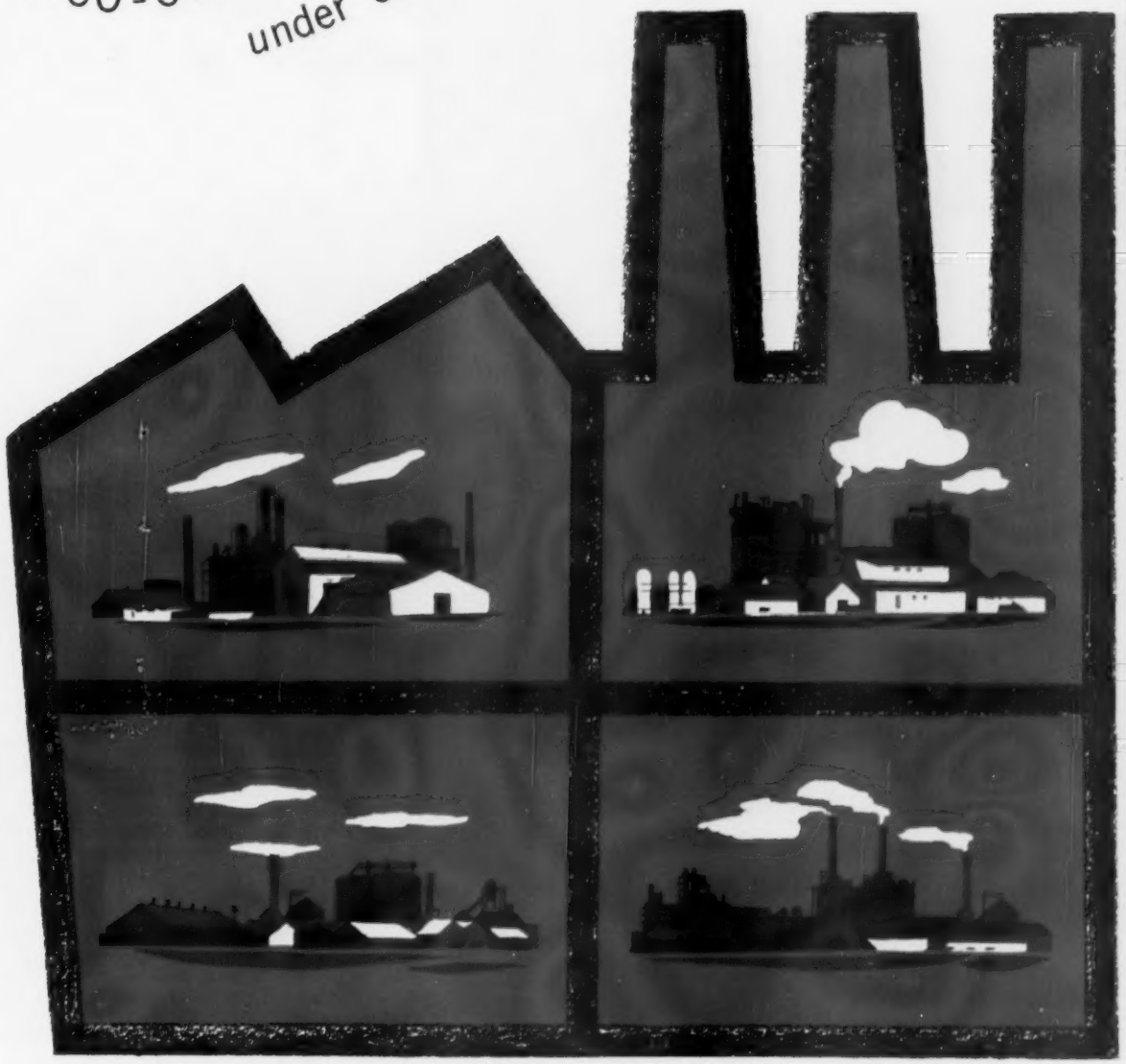

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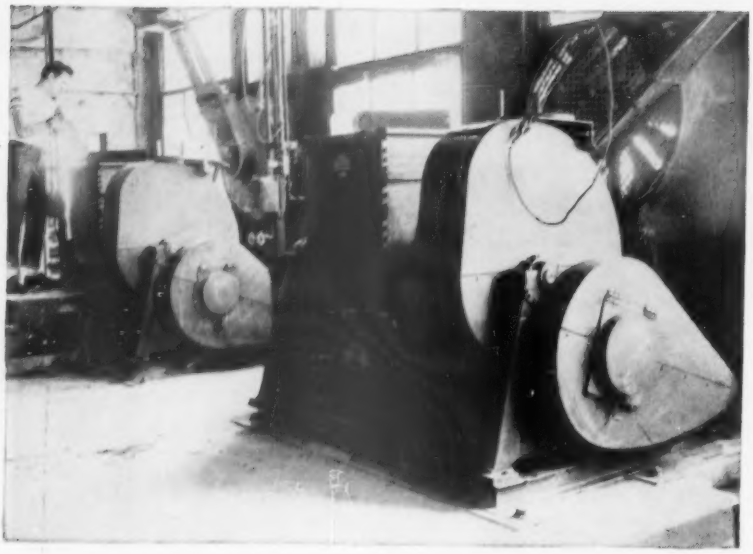

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Modern Design . . .

It will be apparent to many of our readers that RUBBER AGE looks a little different this month. RUBBER AGE, which always keeps pace with the technical developments in the rubber and rubberlike plastics industries, is now being brought abreast of advancements which have been made in the presentation of the printed word. All this, of course, to make this journal more readable and more attractive.

In accordance with the latest publishing techniques, we have taken several steps to make our journal easier to read. As a first measure, we have adopted a new type face, Times Roman. This is a slightly bolder and more legible type than that previously used. We have also increased the white space between the printed lines, and this too adds to easy reading.

In leafing through this issue, readers will note that we have increased the size of the illustrative material throughout the feature section. This will enable a clearer and more graphic portrayal of points that need emphasizing. In line with this change, we have modernized all picture captions—set them in a bolder type. Headlines have been shortened to conform to modern practices. Readers of technical journals have often commented that the titles of articles frequently seem as long as the articles themselves!

In addition, we have completely redesigned our contents and editorial pages. We believe that the modernization of the title page will facilitate the location of articles and other features in the magazine. In future months, we will endeavor to make additional changes in our format—changes designed not only to increase the visual appeal of our publication, but also to increase its effectiveness. Readers will find in our June issue, for example, a completely revised news section.

It will be understood that the revision of a publication's mechanical style involves a great deal of time and labor. We have called upon some of the ablest consultants in the publishing industry to assist us in this project. We hope that the end result justifies our labors and is pleasing to our readers. As always, we would appreciate the comments of our readers as to the changes which have already been put into effect. We would also consider most seriously any suggestions our subscribers might care to advance.

One thing should, of course, be made clear. While the package has been modernized, the product remains the same. The fanciest type will not make more valuable an ineffective or inaccurate article. With its new suit of clothes, RUBBER AGE will continue to stress quality and accuracy. In this way, we hope to bring to our friends in the rubber and rubberlike plastics industries not only the most technically competent rubber journal, but the most attractive as well.

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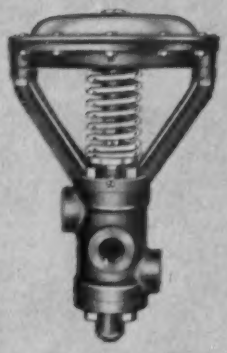

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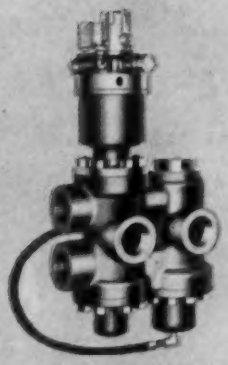

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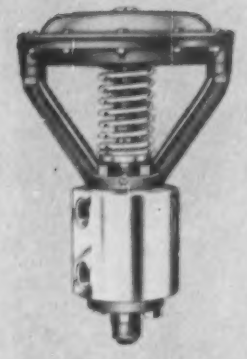

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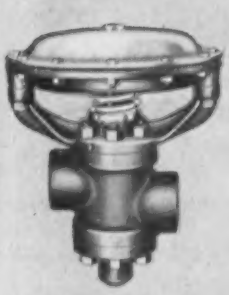

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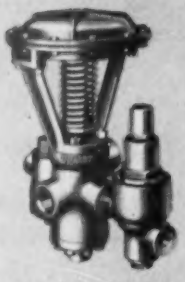

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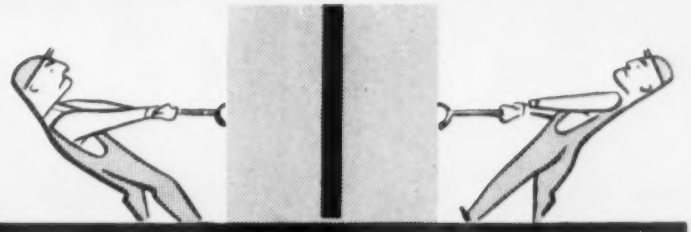

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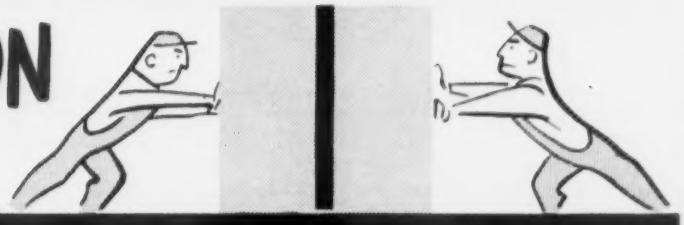

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BOTH ECONOMIES AND BETTER STOCKS RESULT FROM HI-SIL—HARD CLAY COMBINATIONS

A new and lower price of 8 cents per pound in carload lots, effective June 1, is announced for **Hi-Sil 233**. Increased rubber industry demand for this fine particle silica reinforcing pigment has resulted in production economies for Columbia-Southern, making this important price adjustment possible.

It has been noted previously that the advantages of higher quality and lower cost obtainable in **Hi-Sil 233** make it eminently practical to replace other pigments in rubber compounds with combinations of Hi-Sil and hard clay. This can now be demonstrated more strikingly than ever before, because of the new lower price basis. **Hi-Sil 233**–hard clay mixtures will give better quality stocks in natural, GR-S, butyl, neoprene, or nitrile rubbers than can be achieved with silicate pigments at the same cost . . . or will give stocks of equal quality at lower cost.

Compounders can now obtain these definite benefits by replacing any silicate type pigments presently used with mixtures of **Hi-Sil 233** and hard clay:

1. Greatly improved quality (demonstrated in test results below and on facing page) at the same pound-volume cost.
2. Equal quality at lower pound-volume cost.
3. Savings on warehousing, inventory and ordering of two pigments rather than three. Any combination of properties can now be yours through various loadings of **Hi-Sil 233**–clay.
4. Savings on rejection of finished goods. **Hi-Sil 233** mixes more readily and disperses better than the silicate pigments.
5. Savings on uncured scrap. Scrap from compounds based on Hi-Sil–clay mixtures can be reworked in subsequent batches without the undue softening or "mushiness" frequently noted where other pigments have been used.

Please read through the accompanying data for convincing test evidence of these statements.

Here is one of the many comparisons recently completed

(All are available to you as Hi-Sil Bulletin No. 14)

LTP Soling Recipe

A comparison was made between two soling stocks based on low temperature polymerized GR-S containing only a little natural rubber, and high styrene resin. One stock was loaded with a combination of **Hi-Sil 233** and hard clay, the other with a silicate pigment described by its producer as a "hydrated sodium silico aluminate." Both had the *same pound-volume cost.*

The Hi-Sil compound demonstrated higher tensile strength, tear resistance, and elongation; better resistance to abrasion and flexing. Hardness of the two compounds was about the same. The silico aluminate compound had slightly higher modulus.

The obvious superiority of the **Hi-Sil 233**–clay stock is apparent in the following tables.

Formulae

	S	T
GR-S 1502	90	90
#1 Ribbed smoked sheets	10	10
Marbon 8000	35	35
Zinc oxide	5	5
Silico aluminate	86.15	—
Hi-Sil 233	—	61.59
Hard Clay	—	24.53
MBTS	1	1
DOTG	2	2
Sulfur	3.5	3.5
Triethanol amine	0.5	2
100° C. m.p. coumarone resin	7.5	7.5

JUNE 1 . . .

makes quality loadings as on performance

Flex Resistance—Ross Flexer

Compound	Mins. Cure at 320°F.	Length of Break in .01" After Indicated Flexes									
		Original						Aged 24 hours at 212°F.			
		10,000	20,000	30,000	40,000	50,000	60,000	1,000	10,000	20,000	40,000
S	8	61	80	89	93	Comp.	—	55	89	Comp.	—
T	8	37	49	60	71	82	Comp.	24	50	76	96

Compound	Mins. Cure at 320°F.	Modulus 300% E.	Tensile	Elong.	Duro. A	Duro. C	Tear lbs/in.
S	4	1900	2180	370	96	70	350
	8	2050	2160	330	96	72	350
	12	2040	2110	320	96	73	350
	16	2120	2190	310	97	73	340
	20	2100	2120	310	97	73	350
T	4	1460	2710	550	93	69	340
	8	1850	2780	440	97	74	380
	12	1940	2840	420	96	74	370
	16	2010	2740	410	98	73	350
	20	2070	2570	380	99	73	350
Air Oven Aging—96 Hours at 212°F.							
S	8	—	2280	250	98	79	—
	12	—	2160	240	97	80	—
	16	—	2030	160	94	82	—
T	8	2660	2780	320	100	84	—
	12	2640	2770	330	100	84	—
	16	2550	2660	320	99	84	—

Abrasion Resistance—NBS Abrader

	Mins. Cure at 320°F.	Abrasion Index (% of Control B)
S	8	50.1
	12	36.9
T	8	55.6
	12	49.8

These comparisons, and others reported to the industry by Columbia-Southern over the past several years, strongly support our point that compounders can economically realize a virtually unlimited range of properties in non-black stocks through proper Hi-Sil–clay loading. **Hi-Sil 233** imparts high modulus and tensile strength, superior tear and abrasion resistance to colored and transparent stocks designed for many different consumer and industrial applications.

Hi-Sil Bulletin No. 14, reporting in detail eight new comparisons, is now available. To assure prompt receipt of this important paper, please mail a request to our Pittsburgh office, addressing Room 1929-A.

COLUMBIA-SOUTHERN CHEMICAL CORPORATION

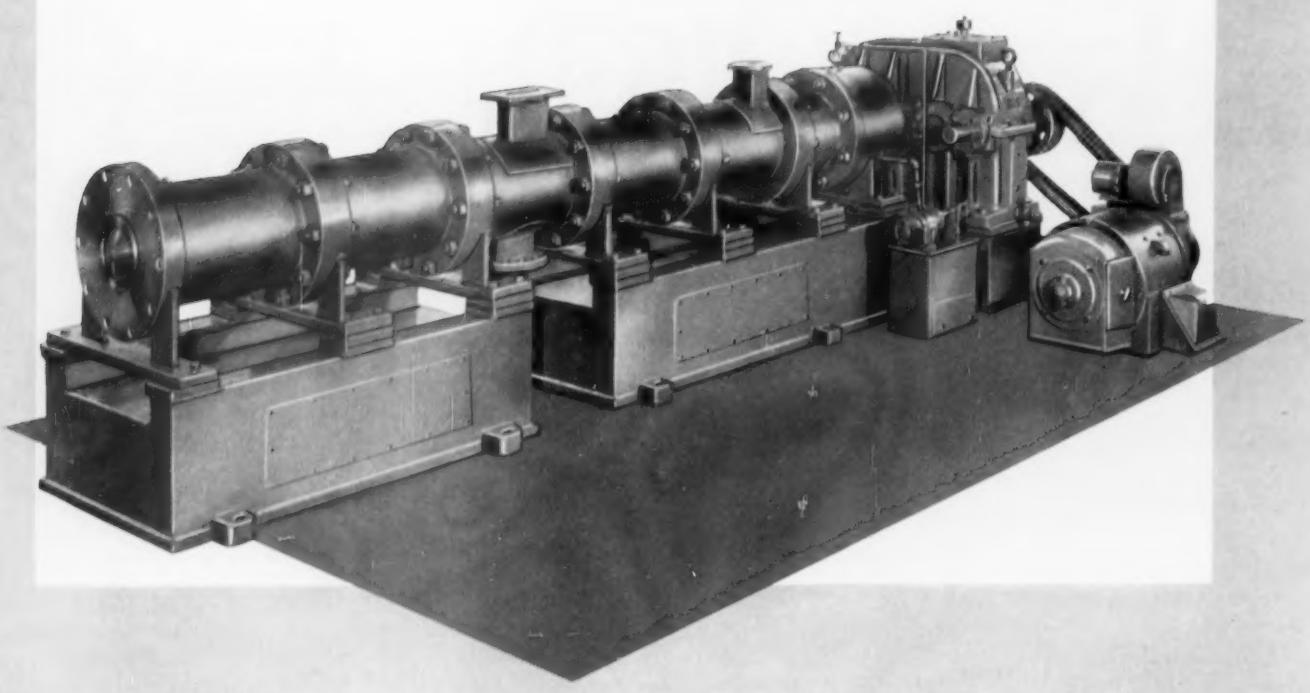
SUBSIDIARY OF PITTSBURGH PLATE GLASS COMPANY

ONE GATEWAY CENTER · PITTSBURGH 22 · PENNSYLVANIA

DISTRICT OFFICES: Cincinnati • Charlotte • Chicago • Cleveland Boston • New York • St. Louis • Minneapolis • New Orleans • Dallas Houston • Pittsburgh • Philadelphia • San Francisco

IN CANADA: Standard Chemical Limited and its Commercial Chemicals Division

Specials... THAT'S US



The 8" extruder illustrated fits into a special processing line. Custom designed for a large chemical company, the extruder had to be designed to coordinate with existing processing, blending and mixing facilities.

Extruders for standard operations can be off-the-shelf models but new processes, new products, new ideas require specific designs. For example, in the processing of polyethylene, we developed special extruders for simultaneous hot and cold feeding. In the fields of foamed plastics, polystyrene, polyethylene, the vinyls, we have designed many individual extruders for processing, blending, reclaiming and devolatilizing.

Most new ideas for special equipment originate in shirt-sleeve sessions with a company's production and engineering personnel. They know their process requirements. We translate these specifications into machines tailored to the job.

If you are working on new ideas in either plastics or rubber, H & K can be of assistance. We have specialized knowledge of these fields and can design a complete plant, a special process or an individual machine. We also have complete engineering service.

YOUR INQUIRY

For prompt response, please address your inquiry to:

Hale and Kullgren, Inc.
613 E. Tallmadge Ave. Akron, Ohio

Sales and Engineering by

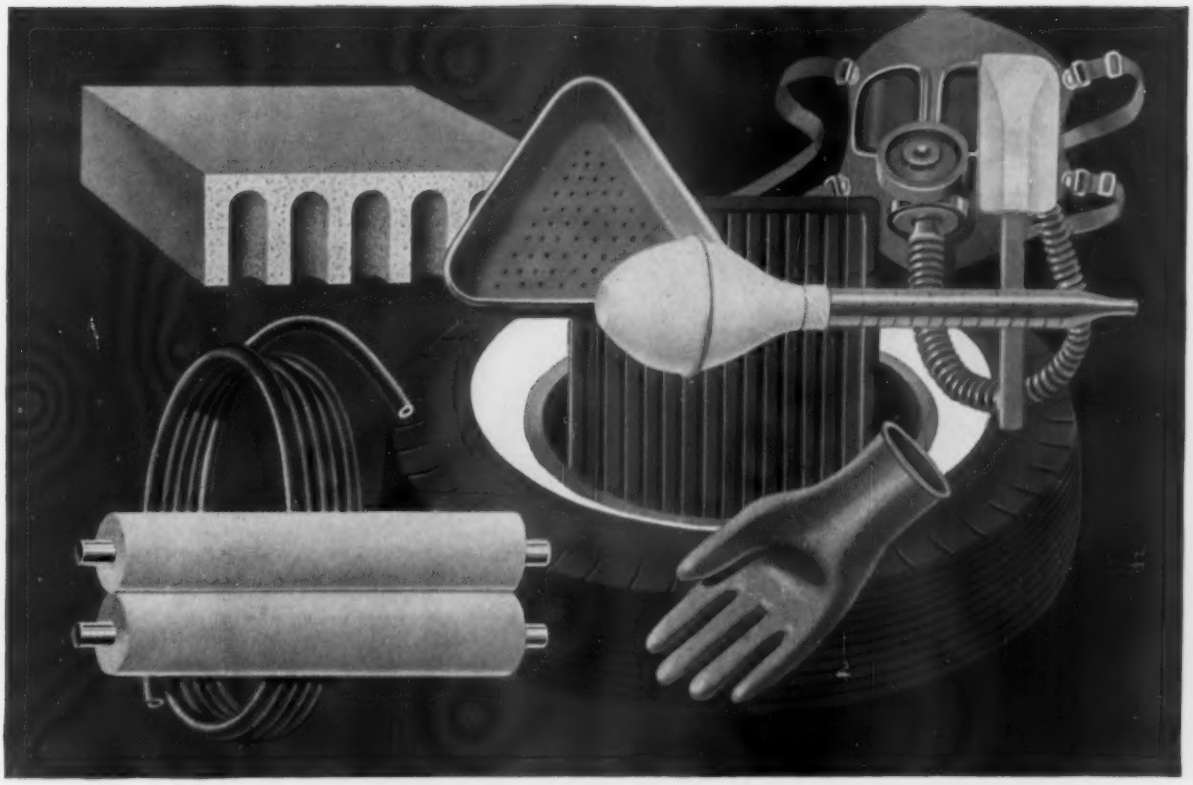
HALE and KULLGREN, INC.

P. O. Box 1231 · AKRON, OHIO

MANUFACTURED BY

THE AETNA-STANDARD ENGINEERING CO., PITTSBURGH, PA.

PLANTS IN WARREN, OHIO · ELLWOOD CITY, PA.



You'll find Nevastain B is a superior non-staining antioxidant at lower cost

Nevastain B is an excellent non-staining, non-discoloring antioxidant developed especially for rubber manufacturers who prefer an antioxidant in the flaked form for greater convenience in compounding operations. It is shipped in sturdy 50-pound bags for easy weighing and handling. *In some instances, Nevastain B can replace products three times higher in cost,* and it has proved itself to be readily compatible with synthetic and natural rubbers, has shown no indication of blooming at more than double normal dosage, and does not interfere with the rate of cure. Write for a sample and the Technical Service Report on Nevastain B.

Neville Chemical Company, Pittsburgh 25, Pa.

Resins—Coumarone-Indene, Heat Reactive, Phenol Modified Coumarone-Indene, Petroleum, Alkylated Phenol • **Oils**—Shingle Stain, Neutral, Plasticizing, Rubber Reclaiming • **Solvents**—2-50 W Hi-Flash, Wire Enamel Thinners, Nevsolv.

NEVILLE

Please send Technical Service Report on Nevastain B.

NAME TITLE

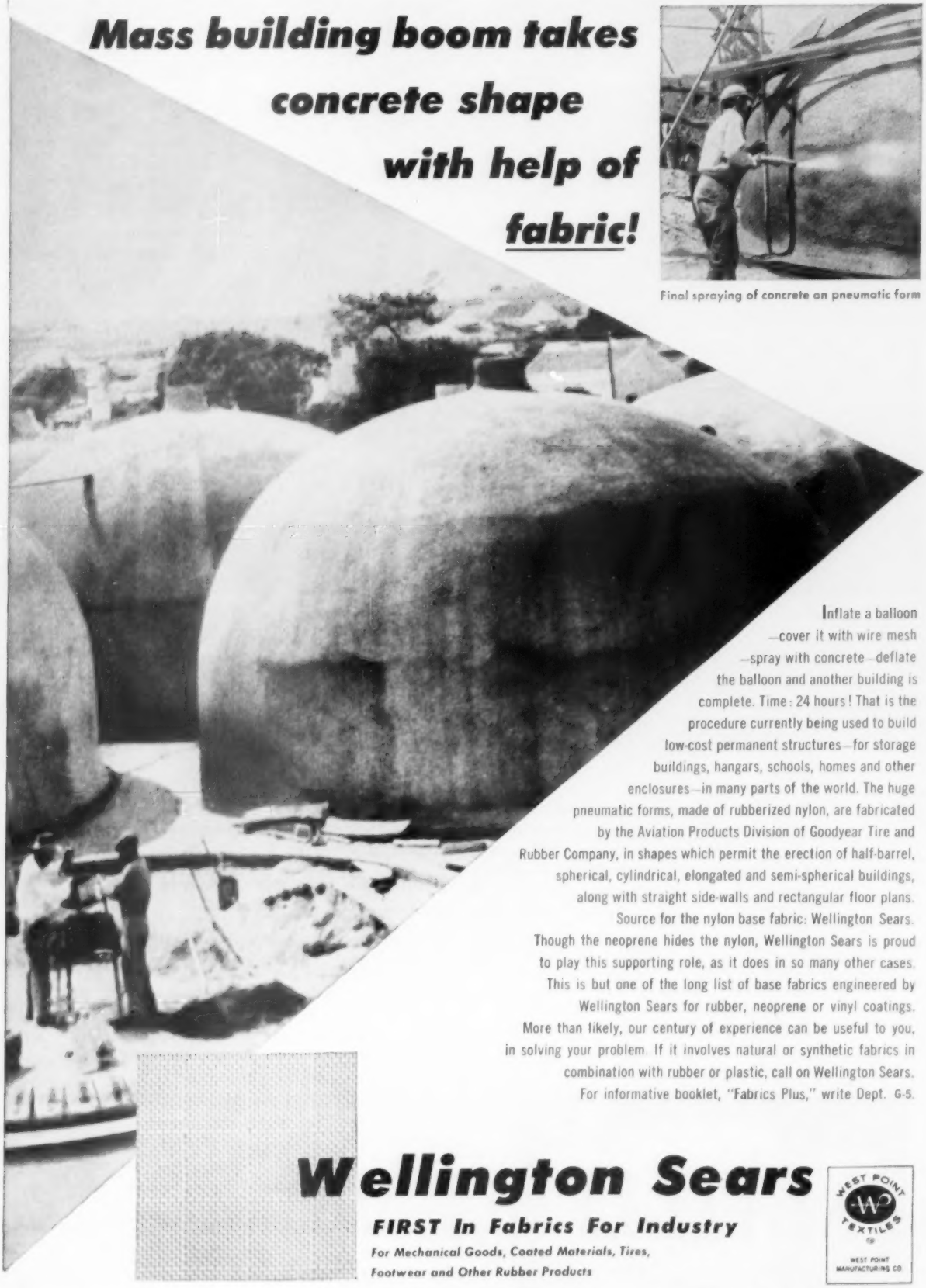
COMPANY

ADDRESS

CITY NC 30-RA STATE

Mass building boom takes concrete shape with help of fabric!

Final spraying of concrete on pneumatic form



Inflate a balloon—cover it with wire mesh—spray with concrete—deflate the balloon and another building is complete. Time: 24 hours! That is the procedure currently being used to build low-cost permanent structures—for storage buildings, hangars, schools, homes and other enclosures—in many parts of the world. The huge pneumatic forms, made of rubberized nylon, are fabricated by the Aviation Products Division of Goodyear Tire and Rubber Company, in shapes which permit the erection of half-barrel, spherical, cylindrical, elongated and semi-spherical buildings, along with straight side-walls and rectangular floor plans.

Source for the nylon base fabric: Wellington Sears. Though the neoprene hides the nylon, Wellington Sears is proud to play this supporting role, as it does in so many other cases. This is but one of the long list of base fabrics engineered by Wellington Sears for rubber, neoprene or vinyl coatings. More than likely, our century of experience can be useful to you, in solving your problem. If it involves natural or synthetic fabrics in combination with rubber or plastic, call on Wellington Sears. For informative booklet, "Fabrics Plus," write Dept. G-5.

Wellington Sears

FIRST In Fabrics For Industry

For Mechanical Goods, Coated Materials, Tires, Footwear and Other Rubber Products

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WEST POINT MANUFACTURING CO.

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Now—rubber you can read through!

Clearly different is this sample of compounded PLIOFLEX—the lighter colored synthetic rubber – pictured above. It's the first time ever that such transparency has been achieved in rubber. And what a host of possible uses it brings to mind – shoe soles, hose, tubing, toys, housewares, novelties.

Easier said than done, however, was finding the right combination of materials to produce this "clear" compound. Over 700 formulations were evaluated before success was realized. And of all the rubbers and pigments tested only combinations of PLIOFLEX 1778 and a silica pigment, Hi-Sil 233, permitted the maximum transparency for both hard and soft products.

The reasons why PLIOFLEX fills the bill so well are its extremely light color, its purity and its excellent general physical properties, not to mention its economy. These, incidentally, are the same reasons why PLIOFLEX is so frequently specified for other, more common uses.

What can you do with PLIOFLEX in "clear" rubber or other applications? Start finding out by writing for full details to: Goodyear, Chemical Division, Dept. E-9419, Akron 16, Ohio.

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Chemigum, Plioflex, Pliolite, Plio-Tuf, Pliovic—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

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Hi-Sil—T.M. Columbia-Southern Chemical Corporation, Pittsburgh, Pa.

High Polymer Resins, Rubbers, Latices and Related Chemicals for the Process Industries

Both first and foam-most!

First and foremost choice of a number of manufacturers of foamed rubber products is one of two Goodyear latices—PLIOLITE LATEX 2104 or PLIOLITE LATEX 2105.

PLIOLITE LATEX 2104 is a "cold" polybutadiene latex which exhibits virtually no odor. This feature plus its high solids content and excellent mechanical stability make PLIOLITE LATEX 2104 extremely well-suited to the production of pillows, mattresses and other types of cushioning.

PLIOLITE LATEX 2105 is a "cold," high solids, butadiene/styrene latex. It, too, exhibits excellent mechanical stability with light color, high physical properties and low temperature flexibility—for advantageous use in foamed goods where very slight odor is permissible.

In addition to these latices, there are a number of other rubber and resin latices in the PLIOLITE family. Each can be used alone or in combination with the others to obtain specific properties in foam or any of the many applications for latex.

Details plus the latest *Tech Book Bulletins* on PLIOLITE LATEX are yours by writing to:

Goodyear, Chemical Division, Akron 16, Ohio

CHEMICAL
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Chemigum, Plioflex, Pliolite, Plio-Tuf, Pliovic—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

COATINGS DEPARTMENT

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What styrene resin for reinforcing synthetic rubber?

The charts reproduced at right represent just some of the reasons for reinforcing styrene rubber with PLIOLITE S-6B.

Besides its decided improvement of physical properties in general, PLIOLITE S-6B offers two other major benefits. First, it serves as a processing aid. And second, it functions as an indirect cost-cutter.

PLIOLITE S-6B works as a processing aid by acting as a plasticizer at elevated temperatures to provide smooth-running, easy-flowing stocks of reduced nerve. It also improves mold reproduction and minimizes warpage and shrinkage of extruded goods.

PLIOLITE S-6B helps cut costs by permitting lighter-weight stocks and/or the use of larger amounts of fillers. It also makes possible substantial economies in mixing, forming and curing, reduces rejects and permits easier work-away of cured scrap.

You'll also find a number of other advantages to compounding styrene rubber with PLIOLITE S-6B. Details plus the latest *Tech Book Bulletins* are yours by writing to:

Goodyear, Chemical Division, Akron 16, Ohio

RUBBER &
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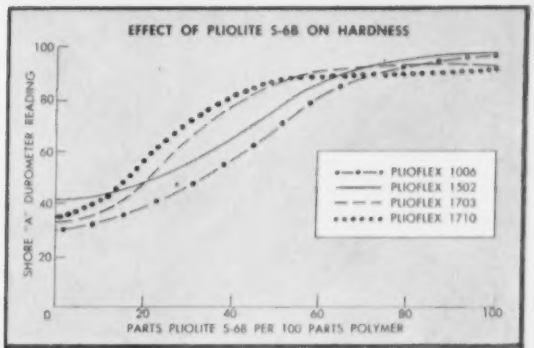
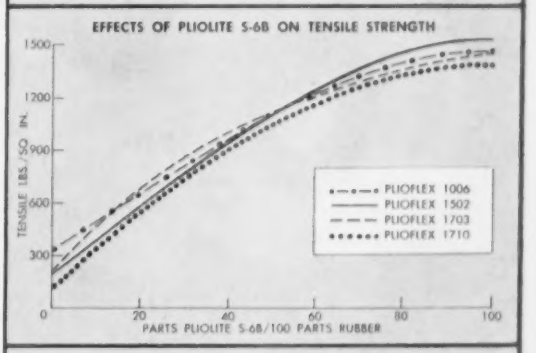
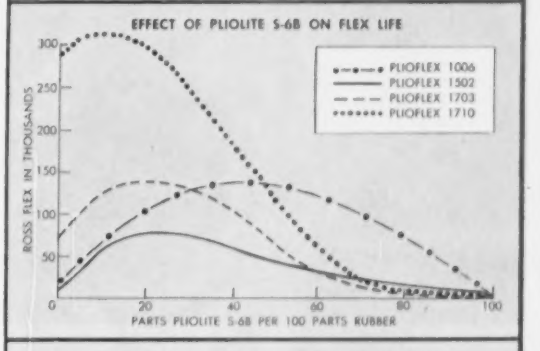
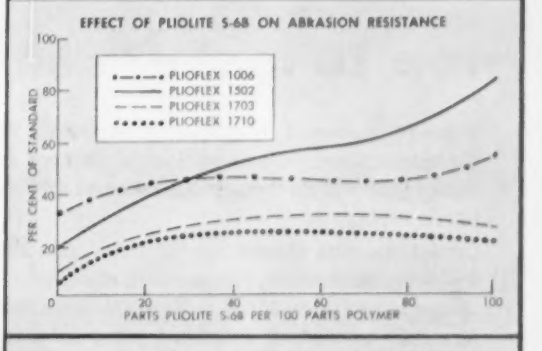
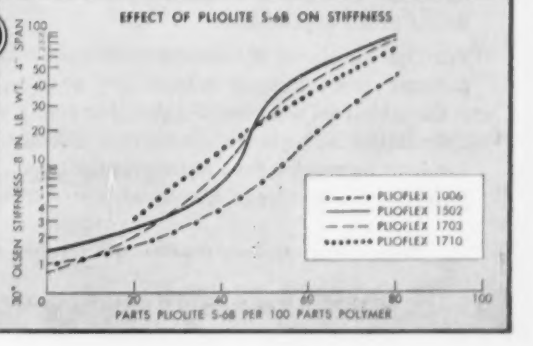
Pliolite, Plioflex—T.M.'s The Goodyear Tire & Rubber Company, Akron, Ohio










EFFECT OF PLIOLITE S-6B ON STIFFNESS
30° OLSEN STIFFNESS—8 IN. LB. WT., 4" SPAN
PARTS PLIOLITE S-6B PER 100 PARTS POLYMER
PLIOFLEX 1006
PLIOFLEX 1502
PLIOFLEX 1703
PLIOFLEX 1710

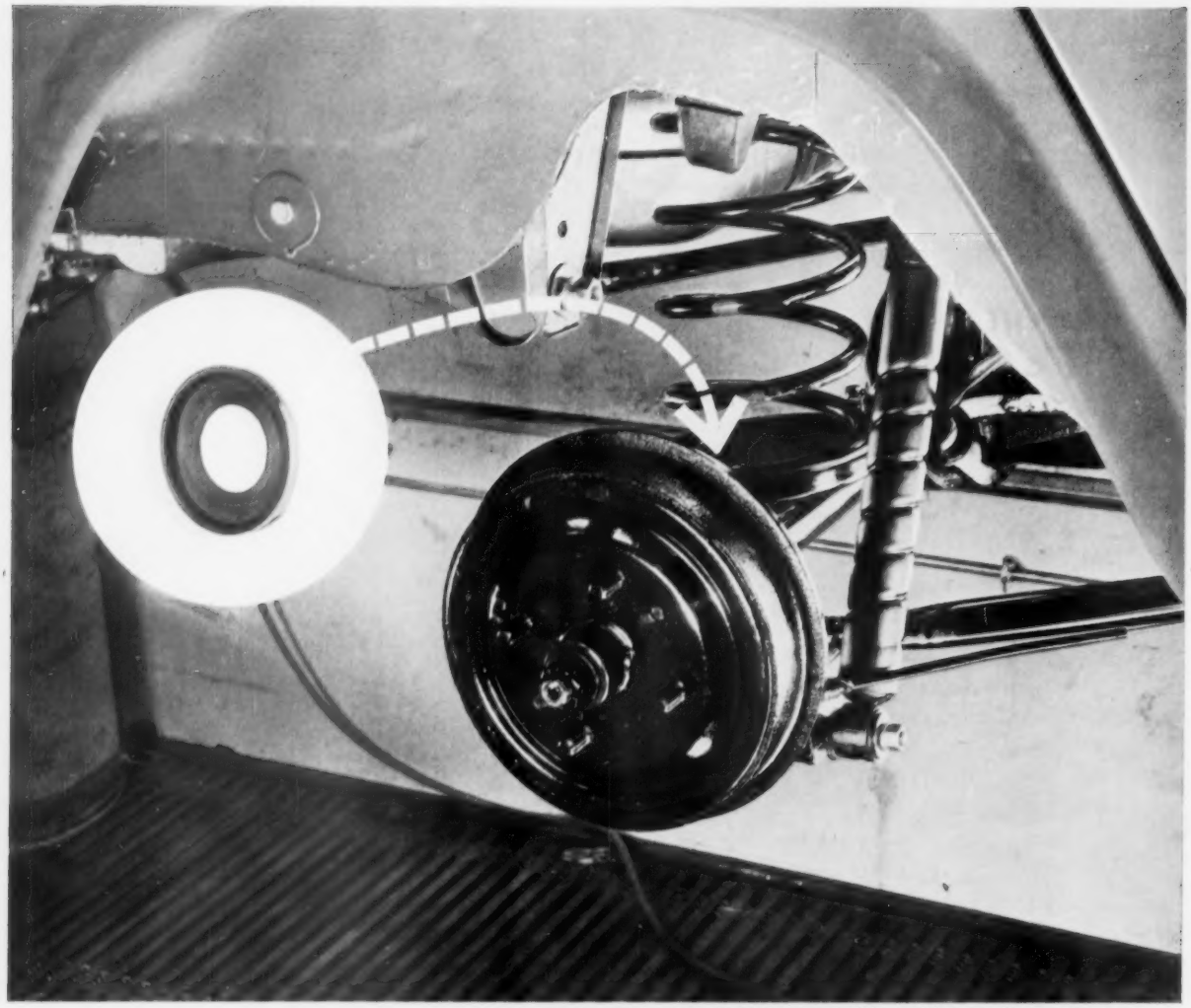


Photo courtesy American Motors Corporation, Detroit, Mich., and Yale Rubber Mfg. Co., Sandusky, Mich.

How to make "sealability" mean salability

If you're interested in making oil seals that will sell, then take two tips from the manufacturer whose product is pictured above. First, develop the simplest design that will do the job. And second, use a compound based on CHEMIGUM nitrile rubber.

CHEMIGUM was chosen for the outer axle shaft seal (shown above) for the following reasons: 1. Outstanding resistance to a range of oils and greases at temperatures up to 250°F. 2. Consistent uniformity. 3. Compatibility with other materials needed. 4. Excellent processability. 5. Physical properties exactly suited to the application.

Through his choice of CHEMIGUM coupled with careful design, this manufacturer has achieved outstanding sealing and performance at reasonable cost – a combination that really sells. How can CHEMIGUM help your ideas become effective realities? Find out by writing for details plus the latest *Tech Book Bulletins* to: Goodyear, Chemical Div., Akron 16, Ohio.

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WIRE SPECIALIZATION *for compatibility with rubber*

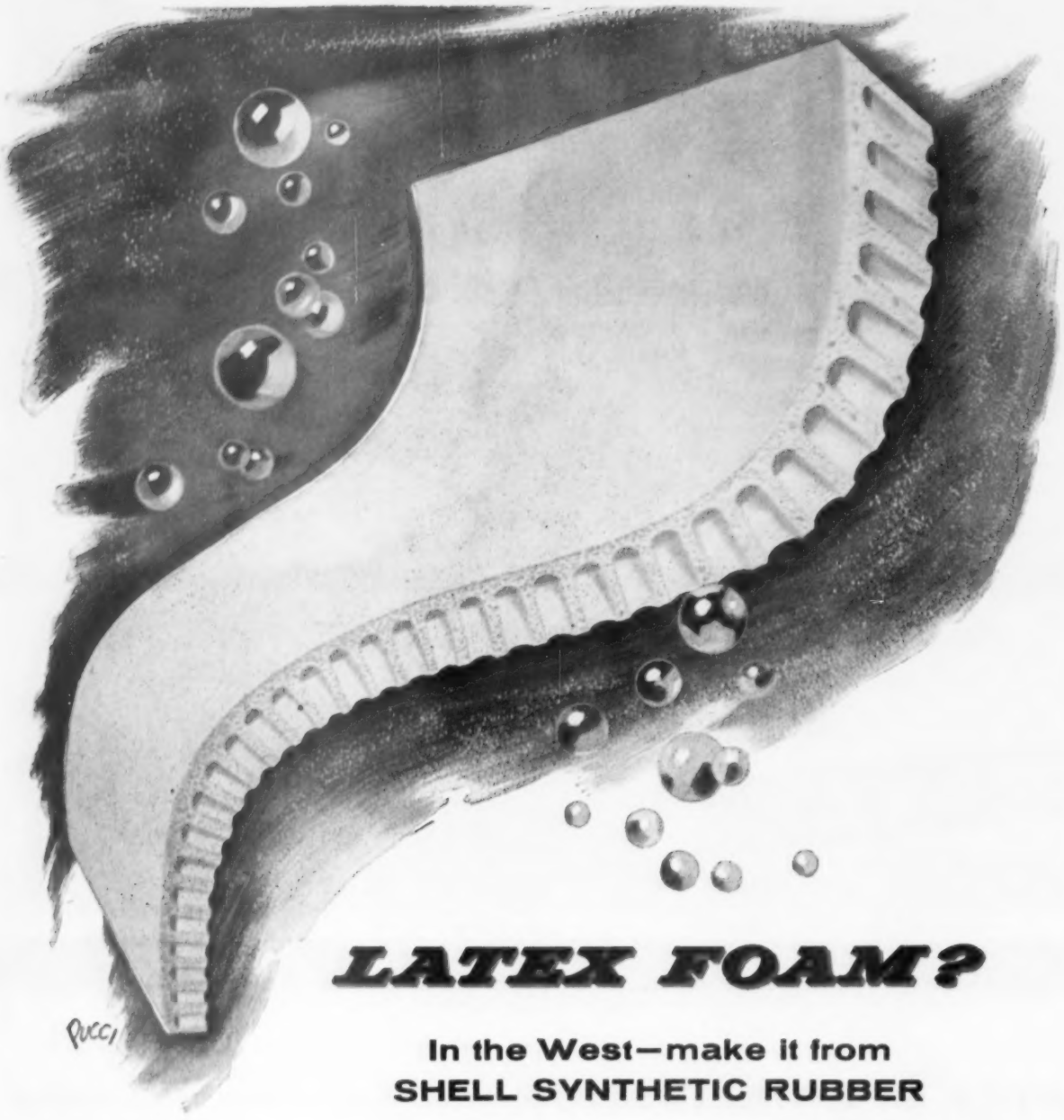
Never hesitate to contact National-Standard for technical help on meeting your wire requirements. As you may already realize, no other company has devoted so many years, or so much concentrated research and development, to the teaming of wire with rubber!

This specialized experience can work to your advantage . . . in determining exactly the right wire, cord, braid or tape . . . in helping you work out details of application, fabrication, wire size, strength, finish, adhesion and the many other variables.

So please remember, National-Standard service is always at *your* service.

NATIONAL STANDARD

DIVISIONS: NATIONAL - STANDARD, Niles, Mich.; tire wire, stainless, music spring and plated wires • WORCESTER WIRE WORKS, Worcester, Mass.; music spring, stainless and plated wires, high and low carbon specialties
WAGNER LITHO MACHINERY, Secaucus, N. J.; metal decorating equipment • ATHENIA STEEL, Clifton, N. J.; flat, high carbon spring steels • REYNOLDS WIRE, Dixon, Ill.; industrial wire cloth



LATEX FOAM?

In the West—make it from SHELL SYNTHETIC RUBBER

If you make or contemplate making foam rubber products, you will be glad to know that a new unit to produce cold high solids butadiene-styrene latices has just come on stream at Torrance.

Shell Chemical's newest Latex S-2105 has excellent uniformity, color and aging properties. It is ideal for latex foam, carpet backing adhesives and other applications where a high-solids latex is required.

In addition to latices, a full line of butadiene-styrene solid type rubber is available to fulfill the requirements of Western manufacturers, large and small.

Convenient location and diversity of product make Torrance your logical Western source for synthetic rubber. Important, too—Shell's Technical Service Laboratory is ready to help you find practical solutions for troublesome technical problems.

Think of Torrance, California, whenever you need synthetic rubber in solid types or liquid latices. Our phone number in Los Angeles is Faculty 1-2340.

SHELL CHEMICAL CORPORATION

Synthetic Rubber Sales Division
P. O. Box 216, Torrance, California

SHELL

Capitol Cues

THE OUTLOOK FOR BUSINESS THIS SPRING is for a slight pick-up in the tempo of activity, after the months of marking time during the past Winter. Analysts in government and industry look for a little more than the firming that's normal at this season. They see the soft spots in the economy—in housing and retail sales of durable goods. But areas of strength dominate.

> What's been happening to business since the first of the year is fairly clear now. After two years of boom, U.S. industry is readjusting to a more normal routine. Supply of materials is generally adequate. Prices of many of these commodities are stabilizing. Businessmen are taking a breather, gearing their buying down to current production. Where stocks are very high, industry is letting them run off. It's mainly an inventory readjustment. It probably won't cut deep or last very long.
>
> There are plus factors still operating—business spending for new plant which will reach a new peak this quarter...rising government spending...increasing consumer outlays for services and soft goods. These are expected to overshadow new drops in home-building and lack of sparkle in auto and appliance sales.

STEEL PRICES WILL BE INCREASED AGAIN, probably this Summer. That's one exception to the trend to more stable material prices. The hike will be $5 or $6 a ton. It will come on top of the $8.50 a ton rise imposed after last Summer's and more recent jumps in charges for special shapes and forms.

> One reason for the hike is the automatic rise in steel-workers' wages that occurs next June under last year's contract. Also, transport and other costs are rising. And the steel mills need funds for expansion. As news of the coming increase spreads, steel-buying will pickup—another aid to business this Spring.

THE ERA OF TIGHT CREDIT MAY NOT BE OVER yet, despite recent easing of interest rates and a slightly smaller demand for loans than a year ago. Some keen analysts in the government and on Wall Street doubt if we'll see much further loosening right away. Indeed, these experts do not rule out the possibility of some further squeeze on credit before this year is out.

> Government borrowing of $2 billion or more over the next few months will mean new competition for available funds. Also, there's reason to think that industry used money earmarked for factory expansion to pay taxes, and will have to replace this later on. Finally, the recent dip in demand for bank loans—easily explained by the slowing in inventory-buying—may be only temporary; business may soon need cash to buy for stock.

DEALING WITH THE DEFENSE DEPARTMENT may be harder in days to come because of the desire for economy in government. Congress means to see what it can do about shaving Pentagon expenses...especially for heavy procurement. Several Congressional committees are probing contractors' profits and costs.

> Lawmakers will also use this opportunity to go into negotiated contracts and the share of defense work going to big business. This will put pressure on the services and make them fussier.

Continued on Next Page

SMALL BUSINESS MAY GET SOME TAX RELIEF this year, after all—though a cut in income tax rates is still out of the question. What small outfits now seem likely to get is a set of three fringe benefits that won't cost the Treasury very much but will, nevertheless, be important to many businesses.

Here's what the program contains:

- Fast depreciation for used machinery costing under $50,000 on the same basis the 1954 Code grants it to new items.
- Estate taxes could be paid over 10 years at the taxpayer's option where one payment would force sale of a going concern.
- Small corporations with 10 stockholders or less could elect to be taxed as partnerships, if they find it advantageous.

These benefits would cost the Treasury $150 million a year.

The program is given a pretty fair chance of passage this year. The Eisenhower Administration itself is expected to endorse it; officials are unhappy over criticism that they are running out on campaign promises made in the '56 campaign. And most of the Congressmen want to do something for small business, too.

LARGE PRODUCTIVITY GAINS ARE LIKELY to occur in manufacturing this year. Latest government figures promise a definite improvement over 1956's disappointing performance. Last year, the rise in output per man-hour of production workers was only slightly more than 2%, well below the postwar average. This year, the gain is likely to be 4%—maybe even as much as 5%.

The disruptions that held productivity to small increases last year have largely disappeared. The production pace is now more relaxed and efficient than it was in 1955-56. Then, the hectic boom required use of obsolete plant and untrained workers while the steel strike temporarily cut output more than employment.

Here's what is expected to happen in some lines this year.

- Metals: Labor peace should bring a jump close to 1955's 10%.
- Machinery: High steady output—helped by continuing heavy demand—should lift productivity 3%. The 1956 gain was 2.4%.
- Lumber: Logging use by home-builders will hold gain to 1-2%.
- Furniture: Story will be about the same as in lumber.
- Textiles: Output per man-hour is heading for a 2% to 3% rise.
- Rubber products: There was a decline in productivity last year as auto output fell. This year, there should be a 3% gain.
- Chemicals: The 6% rate of gain of recent years should hold.
- Petroleum: Productivity gains will be high—5% or 6%.

RAIL FREIGHT RATES WILL GO UP AGAIN this year, maybe this Summer. The roads have applied to the Interstate Commerce Commission for increases from 10% in the South, to 17% in the West. (They just got boosts of 5-7%.) The ICC will grant increases of 10% on many commodities, though exceptions may hold the average to 6-7%. Eastern roads will get most, Southern least.

WHICH LEGAL FORM IS BEST FOR YOUR FIRM—Corporation or partnership or sole proprietorship? The Small Business Administration has explored the question in a leaflet just out. It is titled "Choosing the Legal Structure for Your Firm." You can get it free by writing to SBA, Washington 25, D.C.

In these five Standard Units are all the necessary components to control effectively the degradation mechanisms that take place in polyvinyl chloride resins on aging, during heat processing or on exposure to sunlight. They are widely used alone and in combinations for specific effects in clear and opaque stocks. Their advantages have been proven over other tested materials, such as those based on tin (which frequently decolorizes effects of degradation without correcting them) or on lead (which frequently contributes to oxidation and breakdown on aging). We also supply combinations of components selected from these five Standard Units, to correct special conditions encountered in each Vinyl Processing Industry.

Write for information about stabilizers designed for versatile and inexpensive use in formulations employed in your particular vinyl processing industry.

Is it for—

Quality Vinyl Flooring?
Non-Plating Calendered Stocks?
Maximum Clear Sheets?
Non-Sulfur Staining Films?
Low Cost Clear & Opaque Hose?
Top Physical Properties in Rigids?
Air-Releasing Plastisols?
Controlled Slush Molding?

This Stabilizer System is for

CLEAR SHEETS

Cd 2-V-4

Org 8-V-1

The HARSHAW CHEMICAL Co.

1945 E. 97th STREET • CLEVELAND 6, OHIO

Now everybody's saving money with Dow Corning Silicones

Even the newest chemist knows about Dow Corning silicone mold lubricants . . . how they give easy release, sharper detail and finer surface finish . . . how they step up production, reduce rejects, practically eliminate mold cleaning and maintenance. But do you know all the other places where Dow Corning Silicones improve products, aid production and cut costs?

Defoaming latex, for example. Dow Corning silicone defoamers eliminate bubble trouble during processing of synthetic latices. Economical, too, because small amounts effectively control the most violent and persistent foamers.

Electric motors insulated with job-tested Dow Corning Silicones give more power per pound . . . withstand high temperatures, heavy overloads, excessive humidity. Many production men now specify silicone insulation in mixer and mill motors.

Silastic*, Dow Corning's silicone rubber, is easily fabricated into parts that retain excellent physical and dielectric properties from —130 to 500 F. Available as gums or ready-to-use stocks.

In every rubber plant, it pays to standardize on Dow Corning Silicones . . . Write for more information about the silicone products that interest you. Address Department 9217.

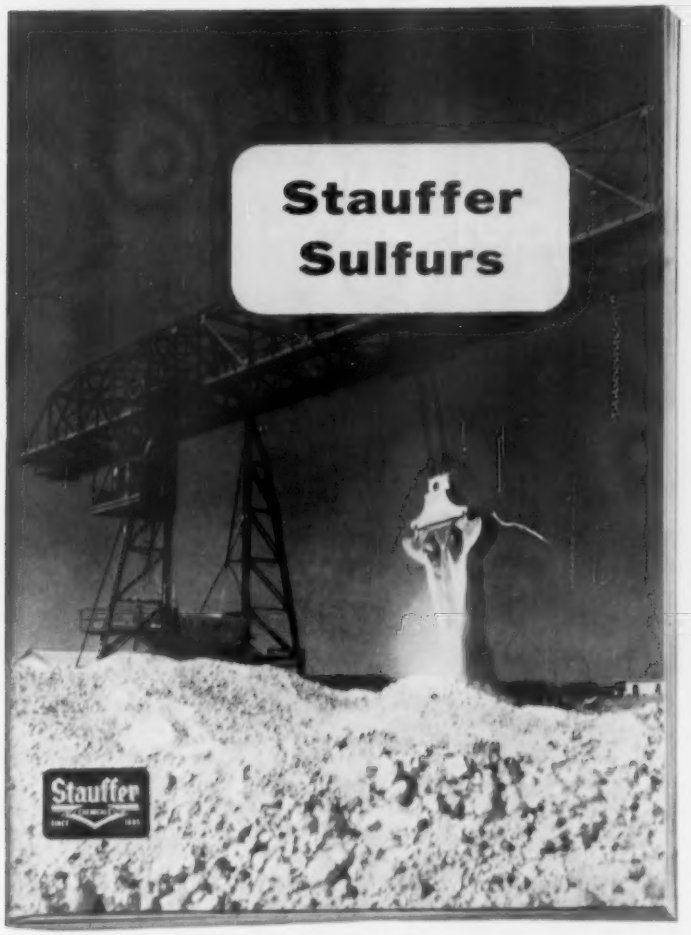
first in silicones

Dow Corning CORPORATION
MIDLAND, MICHIGAN

*T. M. REG. U. S. PAT. OFF.

Sulfur

NOW READY... THE NEWEST BOOK ON THE OLDEST CHEMICAL



Stauffer Chemical Company — largest user and largest marketer of processed Sulfurs — has prepared a new, authoritative treatise and catalog on Sulfur. The history, preparation and uses, with a detailed description of Stauffer Sulfurs are included in a 52-page brochure with many illustrations and useful tables.

COPIES ON REQUEST; PLEASE WRITE ON YOUR LETTERHEAD.

Stauffer CHEMICALS SINCE 1885

STAUFFER CHEMICAL COMPANY

380 Madison Avenue, New York 17, N. Y.
Prudential Plaza, Chicago 1, Ill.
636 California Street, San Francisco 8, Calif.

For Finest Natural Rubber -the Sunshine Vitamin Is Nature's Way...

For Finest Synthetic Rubber -Research and Know-How Is Firestone's Way...

Specify FR-S

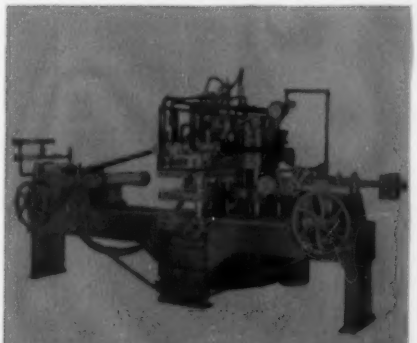
The New, High Quality Synthetic Rubber Made Only By Firestone

The future belongs to men with vision. FR-S rubber that didn't even exist a year or so ago is now in large scale production at Firestone, the world's largest rubber producer . . . thanks to Firestone's top-notch research staff and manufacturing know-how which are unsurpassed in the industry.

In the manufacture of FR-S, there can be no margin for error—that's why every pound is guaranteed to meet the most exacting specifications. Find out how FR-S can improve your product—write today to Firestone Synthetic Rubber and Latex Division, Akron, Ohio.

Firestone

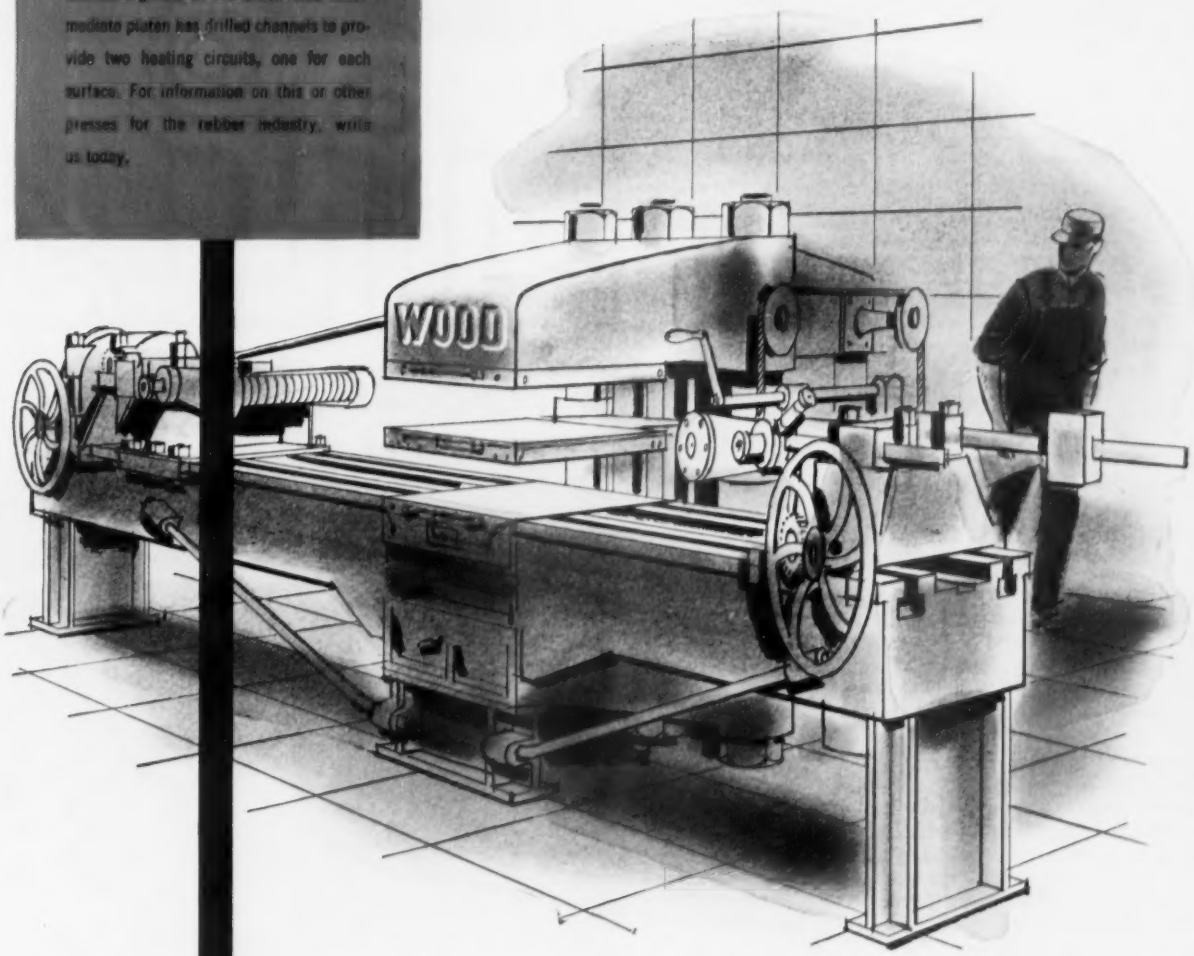
BEST IN RUBBER



Open Gap 47-Ton Belt Press for curing flat and V-type transmission belts. The moving platen is accurately machined from a rolled steel slab and is guided by long, full-round babbitted guides on the strain rods. Intermediate platen has drilled channels to provide two heating circuits, one for each surface. For information on this or other presses for the rubber industry, write us today.

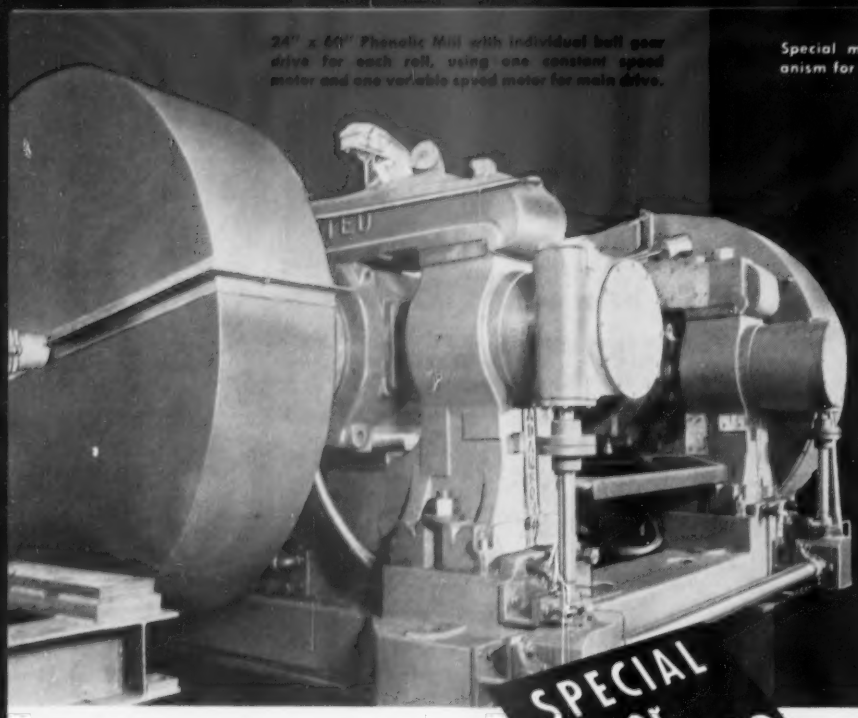
Prelude to low-cost production

When an R. D. Wood Press swings into action, gratifying things happen to production costs. For, in most cases, production climbs to a new high and downtime for repairs approaches zero. The reason is the smooth, dependable performance of R. D. Wood Presses—even under difficult conditions. And the reasons for this superior performance are the exacting standards set by R. D. Wood—in design, selection of materials, and craftsmanship. If your company's theme is low-cost production, here is your prelude—ready made.

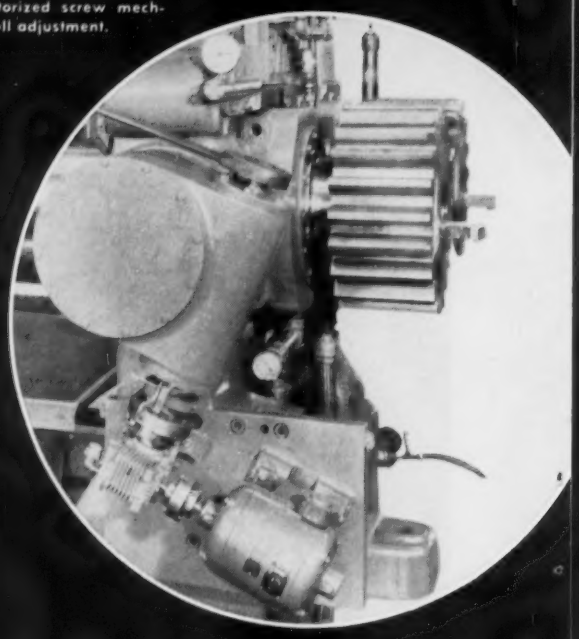


R. D. WOOD COMPANY

PUBLIC LEDGER BUILDING • PHILADELPHIA 5, PENNSYLVANIA



24" x 60" Phenolic Mill with individual ball gear drive for each roll, using one constant speed motor and one variable speed motor for main drive.



Special motorized screw mechanism for roll adjustment.

SPECIAL or STANDARD

ADAMSON UNITED MILLS

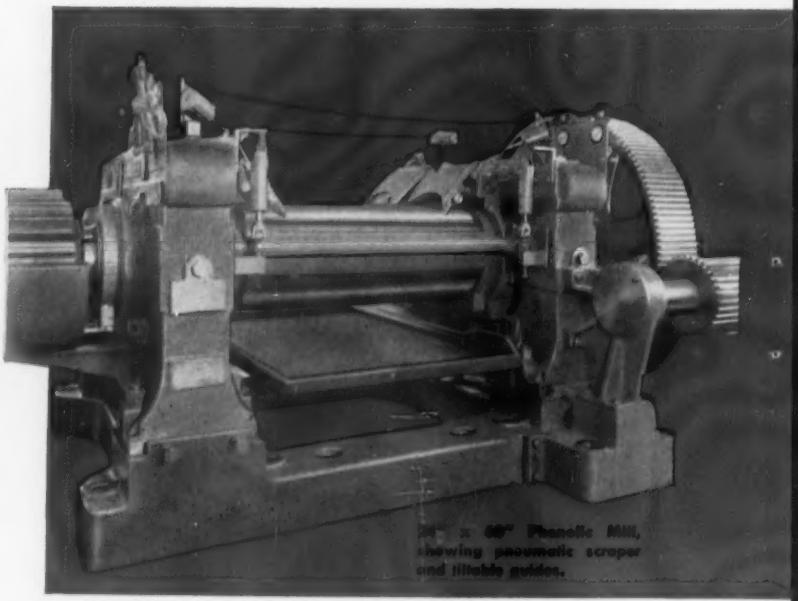
for RUBBER or PLASTICS

we can design . . .
build and install
the right mill
for your requirements

A STANDARD MILL may be all you need. But often the kind of stock to be processed, temperature, gage and production rate, may require an entirely new type of specially designed mill.

Given the necessary data, our engineers, who are thoroughly familiar with today's rubber and plastics processing problems, will modify an existing type of mill or create a new design to exactly meet your requirements. Because the unusual is *usual* at ADAMSON, numerous concerns, for many years, have been turning over their process problems to us to carry through from blueprint to point of production. Our business has been built on that kind of service.

Why not call us in on your next mill installation? There'll be no obligation on your part.



24" x 60" Phenolic Mill, showing pneumatic scraper and tiltable guides.

ADAMSON UNITED COMPANY

730 CARROLL STREET • AKRON 4, OHIO

SALES OFFICES IN PRINCIPAL CITIES

Subsidiary of United Engineering and Foundry Company

Plants at: PITTSBURGH • VANDERGRIFT • YOUNGSTOWN • CANTON • WILMINGTON

7049

4 NEW SUN RUBBER PROCESS AIDS

extend an already versatile list of products to fill all your processing requirements. Sun Oil Company's industry-leading list of high-quality products grows and grows to give you greater flexibility and economy in compounding and processing natural and synthetic rubbers.

PRODUCT	APPLICATION
CIRCOSOL 2XH. An elasticator of special hydrocarbon structures derived from petroleum.	Manufacture of oil-extended polymers. Plasticizer and softener for butadiene-styrene polymers, natural rubber, and combinations of both.
CIRCO LIGHT. A general-purpose, naphthenic type softener.	Manufacture of nonstaining reclaims and butyl inner tubes. Processing regular neoprene and natural rubber.
SUNDEX 53. A moderately aromatic product compatible with natural rubber, regular neoprene, and butadiene-styrene polymers.	Manufacture of oil-extended polymers. Processing tire tread stocks, rubber footwear, matting, toys, semihard rubbers, etc. Extending high Mooney Neoprene type WHV with a maximum loading of 50 parts per 100 parts neoprene.
SUNDEX 1585. A predominantly aromatic product compatible with natural rubber and butadiene-styrene polymers. NEW	Particularly useful in the manufacture of oil-extended polymers where easy processing and optimum aromaticity are required.
SUNDEX 85. Highly aromatic product compatible with natural rubber, butadiene-styrene polymers, neoprene (regular and WHV), and acrylonitrile polymers. NEW	Manufacture of low cost neoprene articles. Particularly useful for extending neoprene with exceptionally high loadings—75 to 100 parts Sundex-85 to 100 parts neoprene type WHV.
SUNDEX 170. A relatively aromatic product with a high molecular weight.	Manufacture of mastic floor tile, battery cases, and resinous binders.
SUNDEX 41. A complex, dark colored blend of high molecular weight petroleum fractions and a specially prepared asphaltum.	Processing natural rubber and butadiene-styrene polymers.
SUN PROCESS AID 515. A nonstaining, highly paraffinic type petroleum derivative with a low viscosity and fair processing ability.	Manufacture of butyl inner tubes. Processing natural rubber and butadiene-styrene polymers where color stability in the finished vulcanizate is important.
SUN PROCESS AID 551. A nonstaining, highly paraffinic type product with a low volatility, medium viscosity, and fair processing ability. NEW	Manufacture of oil-extended polymers where nonstaining of the finished commercial article is important.
SUN PROCESS AID 594. A medium viscosity, naphthenic type petroleum derivative with a low volatility and good processing ability. NEW	Manufacture of oil-extended polymers. Dry mixing process for natural rubber and butadiene-styrene polymers. Economical where some discoloration in the finished rubber can be tolerated.

For full information on these process aids and on Sun lubricants for rubber-process machinery, call your Sun representative or write to Dept. RA-5.

Circosol, Circo, Sun, and Sundex are Registered Trademarks

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY Philadelphia 3, Pa.

IN CANADA: SUN OIL COMPANY LIMITED, TORONTO AND MONTREAL

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laboratory evaluation of new formulations

ALCO VULCANOL® +
ALCO TECHNICAL SERVICE = BETTER PRODUCTS

VULCANOLS, latex-based formulations, are tailored by Alco laboratories to fit your particular requirements. Our laboratories specialize in this type of service.

VULCANOLS can be applied to your product by roller, puddle, spray or dip methods.

They can be used either as coatings or as adhesives. Coating textiles with Vulcanols provides dimensional stability, pile anchorage, slippage resistance, non-skid and non-fray properties and desired hand.

Adhesive uses include laminating paper for tapes and bagging, fabrics for shoes, and scrap foam or curled hair for cushioning.

Have you tried VULCAFOAM® for providing a foam backing for your fabrics?

Our sales and technical staffs will gladly assist you.

Distributor for Firestone Liberian Latex

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GENERAL OFFICE and MANUFACTURING PLANTS
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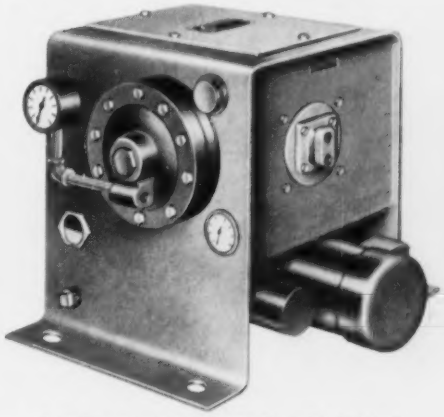
Askania Regulator Company NEWS

Automatic Edge Position Control for Laminators, Slitters, Printers • Adaptable to New or Existing Equipment



Self-Contained Model 550 Edge Guide Ideal for All Types of Light Duty Web Handling Equipment

NEW... Easiest to Install Edge Control Regulator Ever Built!

The new Model 550 Askania Edge Guide is the solution to web handling problems on LIGHT DUTY laminators, printers, slitters.

The Model 550 is easily adapted to new or existing equipment used in the rubber, plastics and paper, film and foil converting fields.

It is more compact—the regulator, pump, motor and oil supply are housed in the *same* unit.

You can INSTALL a Model 550 Edge Guide easier than any other edge guide—a minimum effort is involved.

Askania Edge Guide Controls are Known for Dependability

The same degree of design and construction excellence is incorporated in the Model 550 as is built into the other top quality Askania Edge Controls. You can expect and will get the same performance excellence for your *light duty* operations.

For Example, Check These Advantages

VERSATILE—Guides any material in web form.

SIMPLE—Easy to understand, easy to install, easy to use.

EASY TO MAINTAIN—Needs almost no attention. Any mechanic can take care of it.

DESIGNED BY CONTROL ENGINEERS—Askania Edge Position Control is the only web guide made by specialists in industrial modulating controls.

NON-CONTACT—Nothing touches the web but a breath of air. There's nothing to wear or damage the edge of the material.

DEPENDABLE—Uses the same kind of equipment that heavy industry relies on for the most exacting control jobs. Nothing delicate about it; it's built to take abuse.

ACCURATE—Has never come out second-best in any accuracy test. Proved to be the most accurate web guide on the market.

CONTINUOUS CONTROL—Continuously measures and corrects any runouts. No dead zones. Responds to web position error of half a hundredth of an inch.

NO CLOGGING—Dust, lint, clay or glue will not clog up the control. Use it with dirty materials, or in a dusty atmosphere.

Fill out coupon for your copy of the specific application bulletin you require.

You'll want complete details on what the Model 550 can do for you—how it is used—how it is installed—how it works. Fill out and mail the attached coupon or write Askania Regulator Co., 286 E. Ontario St., Chicago, Ill.

ASKANIA REGULATOR CO. • Chicago, Illinois

Gentlemen:

Send me the application bulletin describing the use of Askania Model 550 Edge Control for:

☐ PAPER CONVERTING ☐ RUBBER ☐ PLASTICS

NAME _____ TITLE _____

COMPANY _____ ADDRESS _____

CITY _____ ZONE _____ STATE _____

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"CONTROLS FOR INDUSTRY"

HYDRAULIC, ELECTRONIC CONTROLS & SERVOS, GENERAL SYSTEMS, ENGINEERING & COMPUTER SERVICE, VALVE ACTUATORS & CYLINDERS

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LINERETTE

for faster Separation on Making Lines

Separation of stock and Linerette paper on the making lines is an easy, efficient operation. Linerette, a specially processed separating paper, prevents adhesion, insures faster operation on the making lines.

And Linerette features are important in other phases of processing, too. Frictioned stocks may be fed from the calender right into Linerette. It leaves no objectionable cloth marks and contains no oil or wax. When used in die-cutting operations, clippings may be worked away with regular scrap.

Linerette supplies additional savings when used in shipping lightweight stocks—there is no need to return a fabric liner. Where cleanliness is a vital factor, Linerette serves as a low cost lining for trays and containers.

GET THE FULL STORY ON CLIMCO PROCESSING

Illustrated booklet tells about Climco Liners and Linerette separating paper. Tells how to get better service from liners. Write for your copy now.

Linerette is supplied in any width up to and including 54″, in rolls of 9″, 11½″, 13″, and 15″ diameters; put up on 3″ i.d. cores. The yield is approximately six square yards to the pound. A 9″ roll contains 375 linear yards and a 15″ diameter about 1150 linear yards.

SAMPLES SENT ON REQUEST—*simply specify width desired.*

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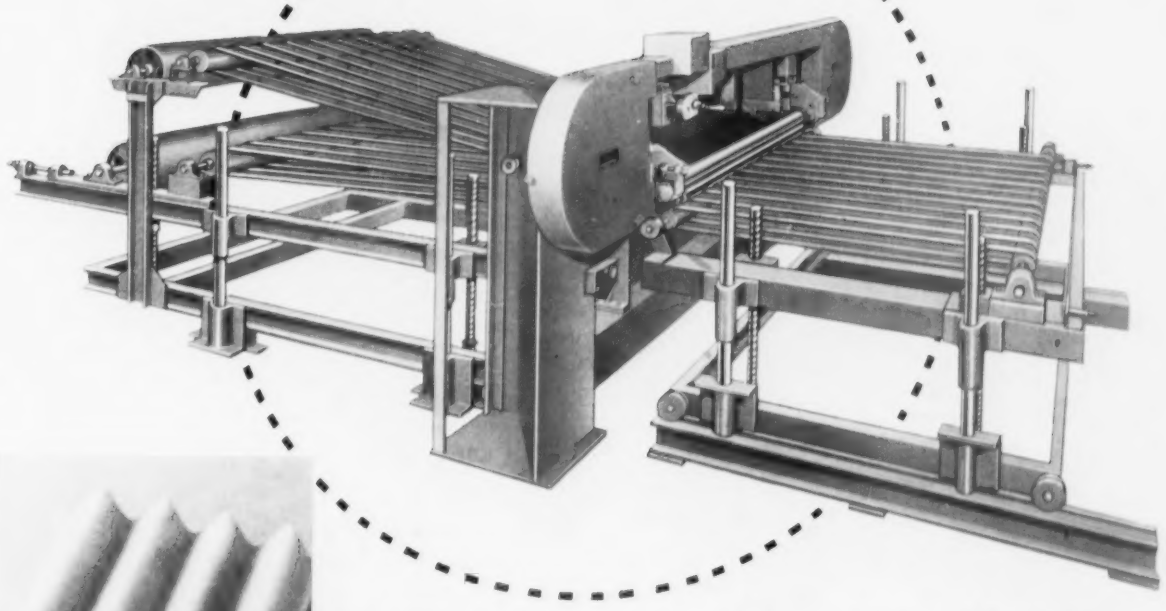
Cable Address: "BLUELINER"

LINERETTE
INTERLEAVING PAPER

CLIMCO

MADE BY THE MANUFACTURERS OF *CLIMCO* PROCESSED LINERS

NOW! A 4 in 1 FEMCO CONVOLUTION MACHINE



You Can make Cuts Like This on the Convolution Machine

It's NEW! It's the Machine that does FOUR JOBS IN ONE! It LEVELS Stock, it SPLITS Stock, it handles LARGE SLABS or ROLLS and cuts SCALLOPED EDGES!

Yes, this Machine LEVELS like our Cushion Cutter, SPLITS like our Model 65-78 Splitter, and takes large (9 ft. long or longer) slabs or rolls like our single head conveyorized Slab Cutter! It does all this—PLUS the Convoluting features which produce irregular or scalloped cuts on Polyurethane and Polyvinyl Foam stock. It splits stock into sheets to 1/8" from material with a maximum thickness of 15". Ask about this time saving, money saving, space saving newest of FEMCO'S 22 Special Machines!

WRITE TODAY FOR FACTS AND PHOTOS

1917 40th ANNIVERSARY 1957

The FALLS ENGINEERING AND MACHINE CO.

Established 1917

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FEMCO'S V-BELT EQUIPMENT

includes Collapsible and Ring Molds, Curing Cages, Autoclave Type Belt Molders, Hydraulic and Manual Manipulators, Vertical and Horizontal Type Measuring and Matching Machines, Notching Machines, the new and improved V-Belt Skiving Machine, and a new and improved V-Belt Collapsible Building Drum. Call us first for this equipment.

TEXUS proudly announces the development of a non-volatile pale naphthenic oil... used exclusively in new improved SYNPOLS.

Now! Oil-extended FAST, HIGH-

Here for the first time are *light-colored*, non-volatile oil-extended polymers in the popular 1703, 1707 and 1708 types. These SYNPOLS are completely interchangeable with current dark-colored types of the same number. Ask your TEXUS representative to show you this comparison case.

Polymers combining TEMPERATURE PROCESSING with LIGHT COLOR

A new, non-volatile pale oil that makes possible *light-colored* oil-extended polymers that are *completely interchangeable* in rubber formulations with current dark-colored rubbers of the same numbers . . . this development is the latest and most significant in a series of improvements in synthetic rubber production by Texas-U. S. Chemical Company.

Used *exclusively* in TEXUS SYNPOL oil-extended polymers, this unique pale oil is specially refined from carefully selected naphthenic crudes and is comparable in volatility to the standard dark extending oils. It eliminates the processing problems caused by the volatility of currently used light-colored oils. Thus TEXUS, alone, is able to offer, for the first time in the 1700 series, *light-colored* butadiene-styrene polymers which can be processed at *high temperatures*, permitting fast Banbury and mill mixing. Furthermore, they are non-migrating and their vulcanizates retain their light colors even after extreme and prolonged exposure to sunlight and heat.

SIMPLIFIES PROCESSING PROBLEMS

Extensive factory tests and manufacturing usage *minimize* your needs for time-consuming testing and compound adjustment when adopting these completely interchangeable light-colored SYNPOL oil-extended polymers. Their use eliminates double inventory—one grade for dark products, another for products in which light or pastel colors are more important than fast-processing qualities. These TEXUS SYNPOLS give you *both* advantages!

Here are the three light-colored SYNPOLS, made with the new TEXUS non-volatile pale oil, which offer you unprecedented opportunities for the economical manufacture of many *new* light-stable, white, bright and pastel-colored rubber products:

IMPROVED SYNPOL 1703

A new 25-parts naphthenic pale non-volatile oil-extended polymer, completely interchangeable with any other 1703. Its light color makes possible lighter shades and brighter colors in rubber toys, floor tile and shoe soles; identifying colors in belting and other mechanical rubber goods . . . and a host of colorful new products.

IMPROVED SYNPOL 1707

A new 37.5-parts naphthenic pale non-volatile oil-extended polymer, and the only light-colored rubber of this grade on the market today. In addition to replacing other 1707 polymers, it provides an economical substitute, in whole or in part, for 1500 and 1551 types.

IMPROVED SYNPOL 1708

A new 37.5-parts naphthenic pale non-volatile oil-extended polymer made with a glue-acid coagulant to assure low ash content and low moisture-absorption characteristics. This, combined with its light color, makes it an excellent choice for wire insulation—particularly where color coding is important. Based on an all-fatty-acid emulsifier, this general-purpose oil-extended polymer provides an economical replacement for grades 1000, 1001, 1006 and 1061 in a wide variety of light-colored products.

TEXUS

Sales Agent:
Naugatuck Chemical
Naugatuck, Conn.

Plants and General Offices:
Texas-U. S. Chemical Co.
Port Neches, Texas

TEXAS-U. S. CHEMICAL COMPANY

260 Madison Ave., New York 16, N. Y.

In Your Latex Compounds . . .

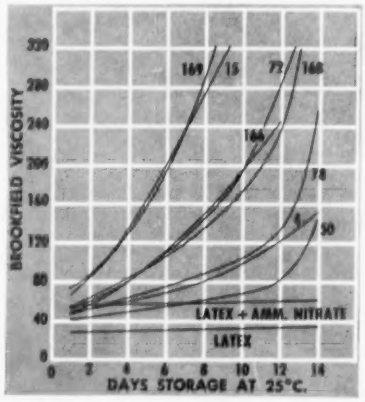
WHICH HORSE HEAD ZINC OXIDE DO YOU NEED?

Most formulators agree that zinc oxide is the most critical ingredient to select for latex use.

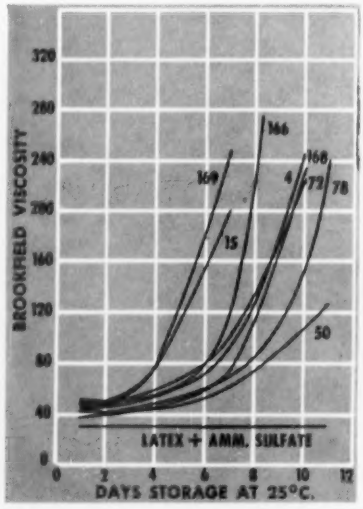
Here's why:

1. YOU can choose from many types of zinc oxides, and each type influences such important properties of latex compounds as viscosity, suspension, stability, rate of gelation and rate of cure.
2. YOU can't predict the influence of any type of zinc oxide on the properties of your latex compound . . . because the influence of a zinc oxide depends upon the specific latex formulation, as shown in the charts at right.

So . . . for best results, test the widest range of types—the Horse Head family—including the exclusive Kadox and Protox* brands.



Influence of zinc oxides on the chemical stability of latex containing 1% NH_4NO_3



Influence of zinc oxides on the chemical stability of latex containing 1% $(NH_4)_2SO_4$.

HORSE HEAD ZINC OXIDES FOR LATEX

Brand	Surface Area (Sq. M /Gm.)	Process of Mfg. American	Process of Mfg. French	Propionic Acid Surface Treatment
XX-50	3.0	✓		
XX-78	3.9		✓	
XX-4	4.4	✓		
Protox–166	4.4	✓		✓
Kadox–72	7.9		✓	
Protox–168	7.9		✓	✓
Kadox–15	10.0		✓	
Protox–169	10.0		✓	✓

*U. S. Patents 2,303,329 and 2,303,330

THE NEW JERSEY ZINC COMPANY

Producers of Horse Head Zinc Pigments

. . . most used by rubber manufacturers since 1852

160 Front Street, New York 38, N. Y.

* *Everyone's talking about the new "cold," low Mooney polymer*

ASRC 3110!

Gives improved processing... better quality!

Rubber parts courtesy of Brown Rubber Co., Inc.

ASRC is now in production with a new, non-staining "cold," low Mooney rubber—ASRC 3110—which offers improved processing of molded and extruded sponge rubber parts. Users can expect easier mixing . . . smoother extrusion . . . faster extrusion rates . . . smoother calendering . . . less shrinkage.

ASRC 3110 also gives improved quality, such as better aging . . . higher tensile strength . . . and better hot tear resistance.

Literature and test samples available upon request.

ASRC

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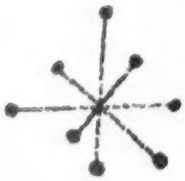
Midwest Sales Office: 22 Riverbend Pkwy., Fremont, Ohio • Plant and General Offices: Louisville, Ky.
Cable: AMSYNRUB NEWYORK



* space

costs

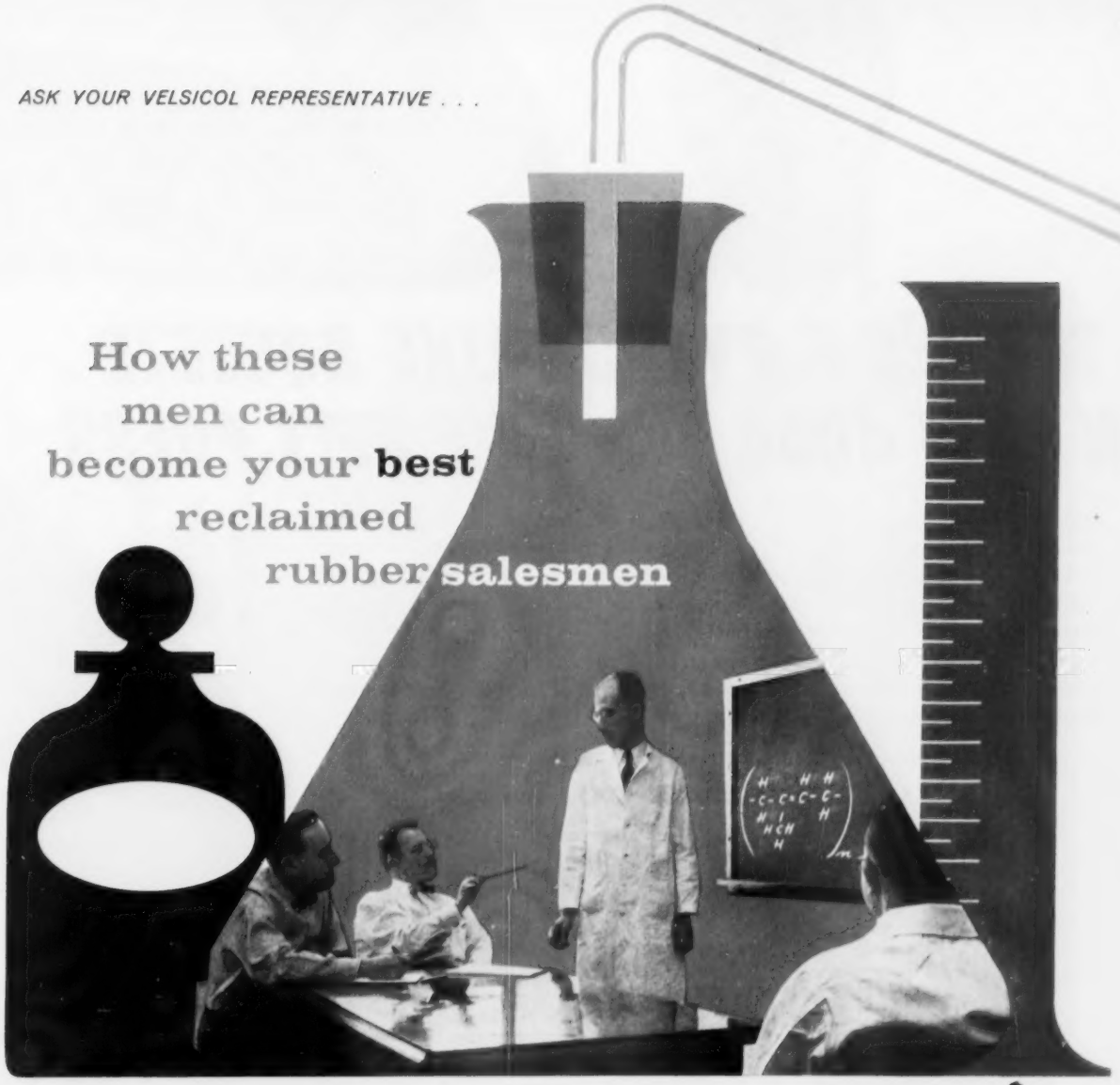
money

Reduce storage space substantially by specifying **ST. JOE surface-treated ZINC OXIDE in PELLET FORM.** Other advantages: Free-flowing — improved handling properties • Freedom from dustiness — better plant housekeeping • Faster incorporation in rubber • Superior dispersion in rubber.

ST. JOSEPH LEAD COMPANY
250 PARK AVENUE, NEW YORK 17, N. Y.
Plant & Laboratory: Monaca (Josephtown) Pa.

ASK YOUR VELSICOL REPRESENTATIVE . . .

How these men can become your **best** reclaimed rubber salesmen



Velsicol chemists, working with information furnished by your Velsicol representative, can develop custom reclaiming oils that will make your reclaimed rubber easier to process and easier to combine with natural and synthetic rubber. By supplying an oil that meets your exact requirements, they can increase your sales to new and existing markets, and greatly improve your competitive position. Contact your Velsicol representative now, and put Velsicol research to work in your reclaiming processes. No cost or obligation. Mail the coupon today for new technical literature!

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LOOK FOR THIS MAN

Your Velsicol representative . . . a qualified chemist who will help you make better products for less!

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330 EAST GRAND AVENUE, CHICAGO 11, ILLINOIS

VELSICOL CHEMICAL CORPORATION
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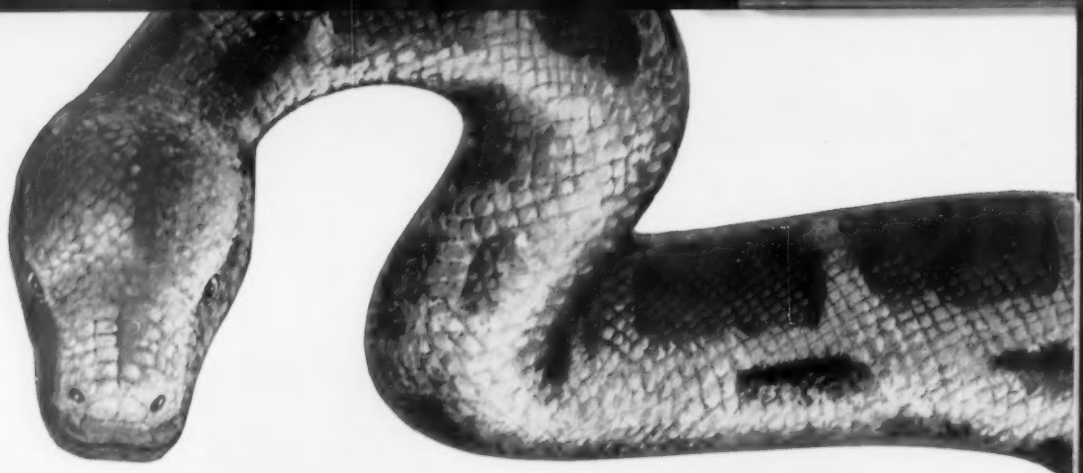
- ☐ Please have a salesman call to discuss custom made reclaiming oils.
- ☐ Please send a sample for pilot plant use.
- ☐ Please send technical literature.

NAME_____
COMPANY_____
ADDRESS_____
CITY_____ ZONE____ STATE_____



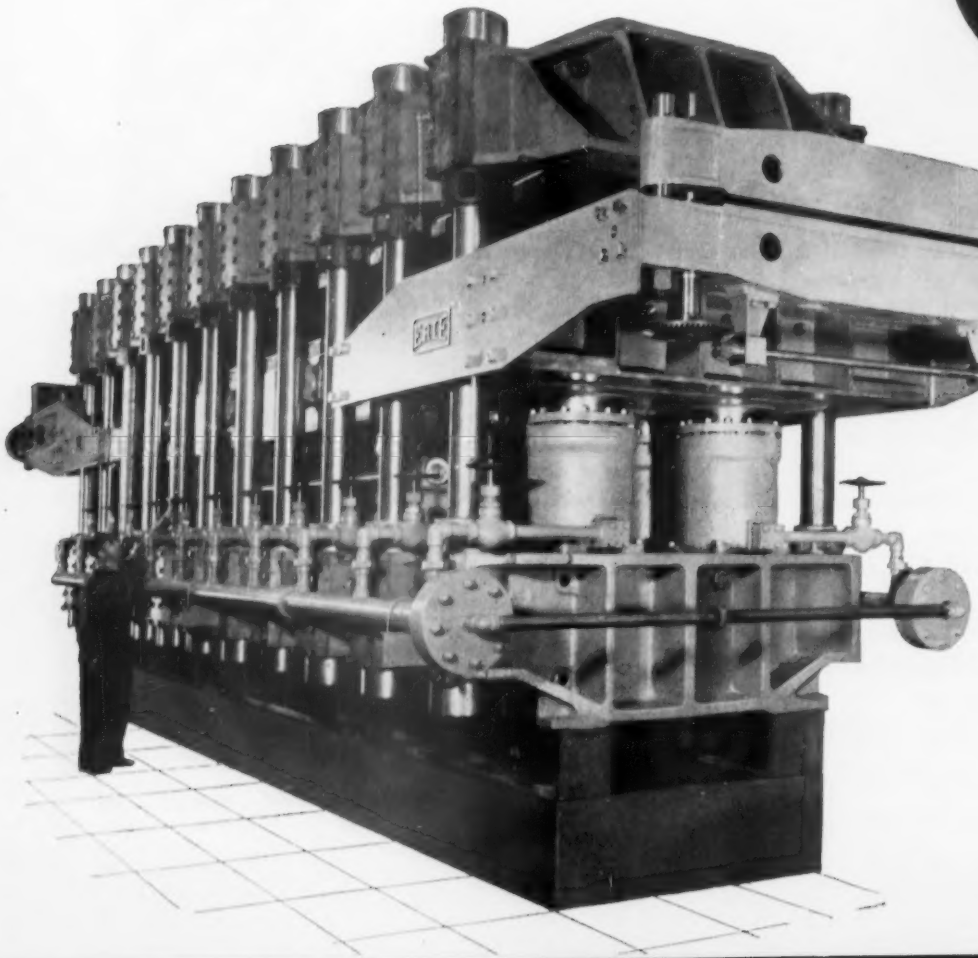
THERE'S A PYTHON-LIKE SQUEEZE IN THIS 4000-TON ERIE BELT PRESS

Here is one of the largest belt presses ever built. It is the type of job which is routine specialization for Erie Foundry. The press has twenty-two 16" rams with a 14" stroke, and a 14" opening which will cure a conveyor belt 68" wide by 30' long. Weighing over 400,000 pounds, its base area is 8'x 30'. And the specially designed MECHANICAL STRETCHER assures even stretching of the belt on each and every cure cycle.

If you are considering a new compression press, consult ERIE FOUNDRY—the builders whose experience and know-how cover a broad range of hydraulic presses. Please write for more information.

Hydraulic Press Division

ERIE FOUNDRY CO. ERIE 6, PA.

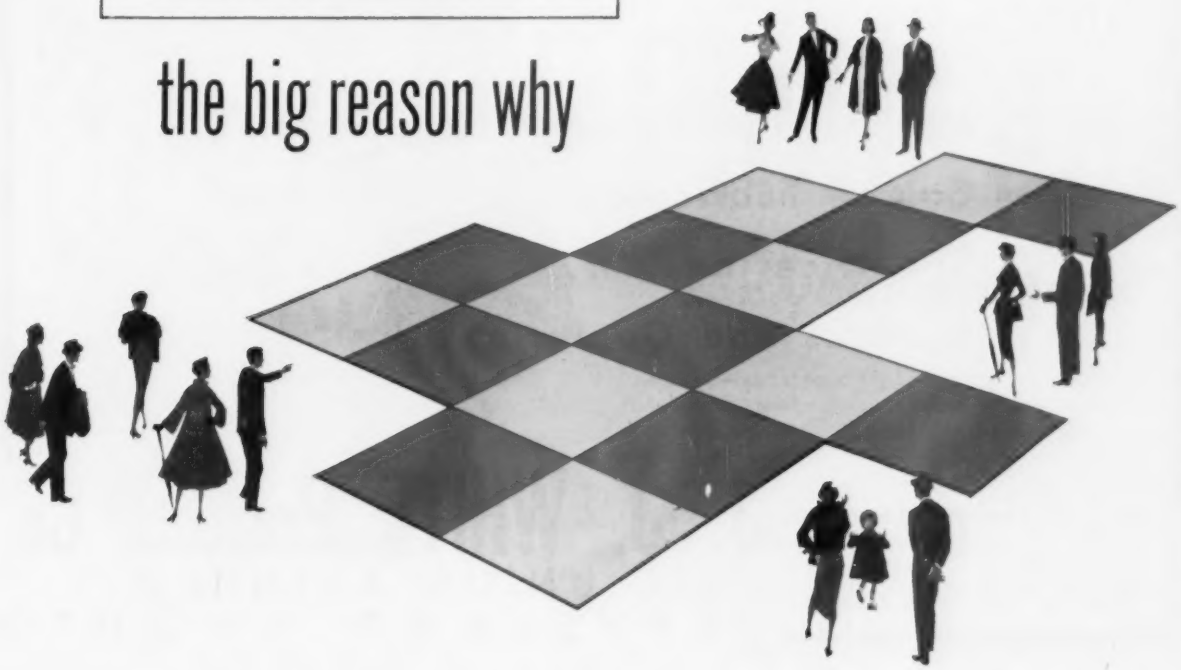


ERIE

SINCE 1895

PERMANENCE...

the big reason why



PLASTOLEIN® 9720 Polymeric
is preferred for vinyl floor tile

It will pay you to investigate Plastolein 9720 Polymeric because it provides the extreme permanence and durability so vital to the life of your vinyl flooring. This results primarily from 9720's outstanding performance relating to such factors as dimensional stability, heat and light stability, volatility, and extraction.

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With all these advantages, why not try Plastolein 9720 in your vinyl tile formulations—or in any formulation where permanence is essential.

For complete details on 9720 or any of the Plastolein Plasticizers, mail coupon below:

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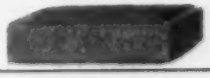
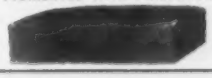
	NON-PIGMENTED 	PIGMENTED WITH PHILBLACK* 
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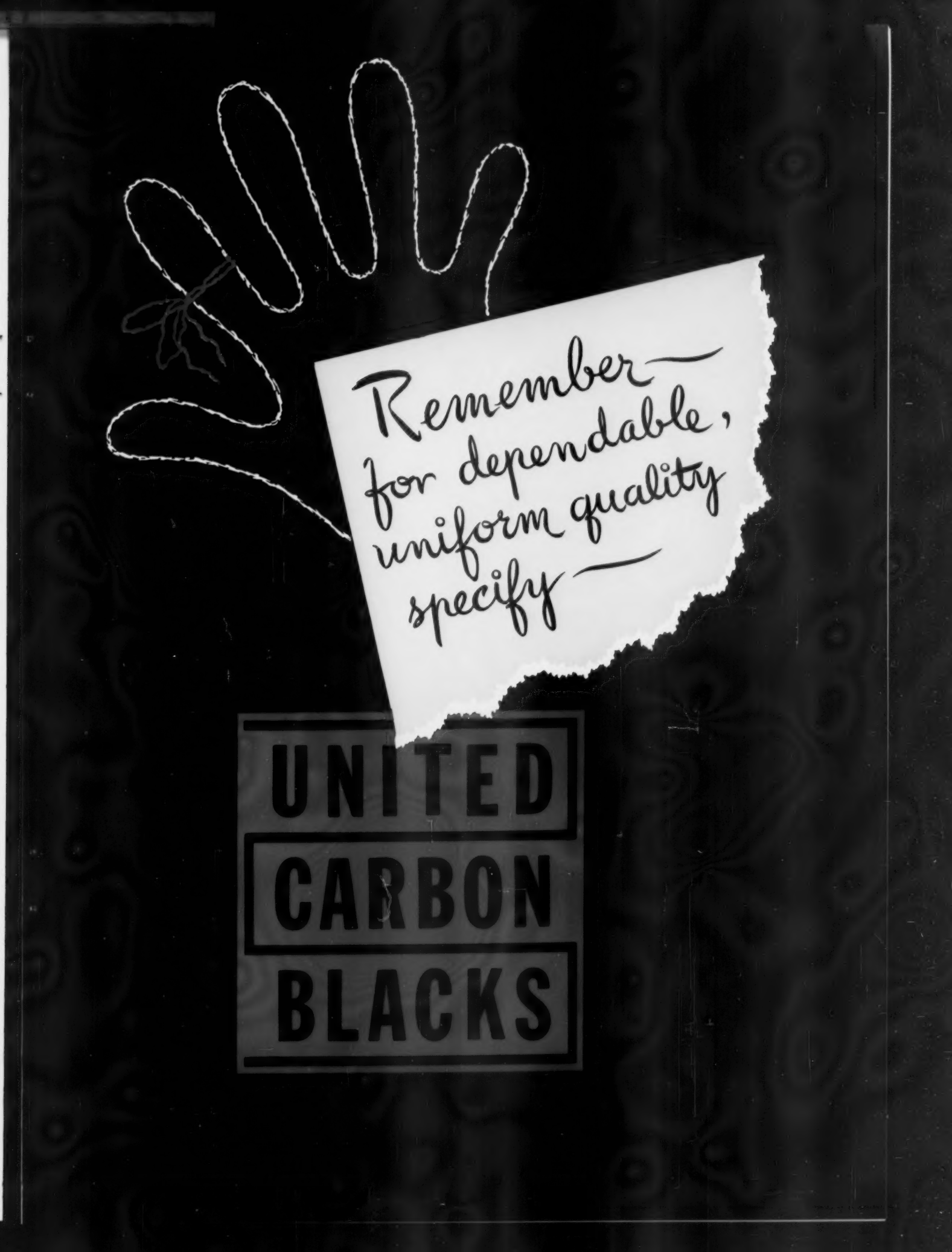
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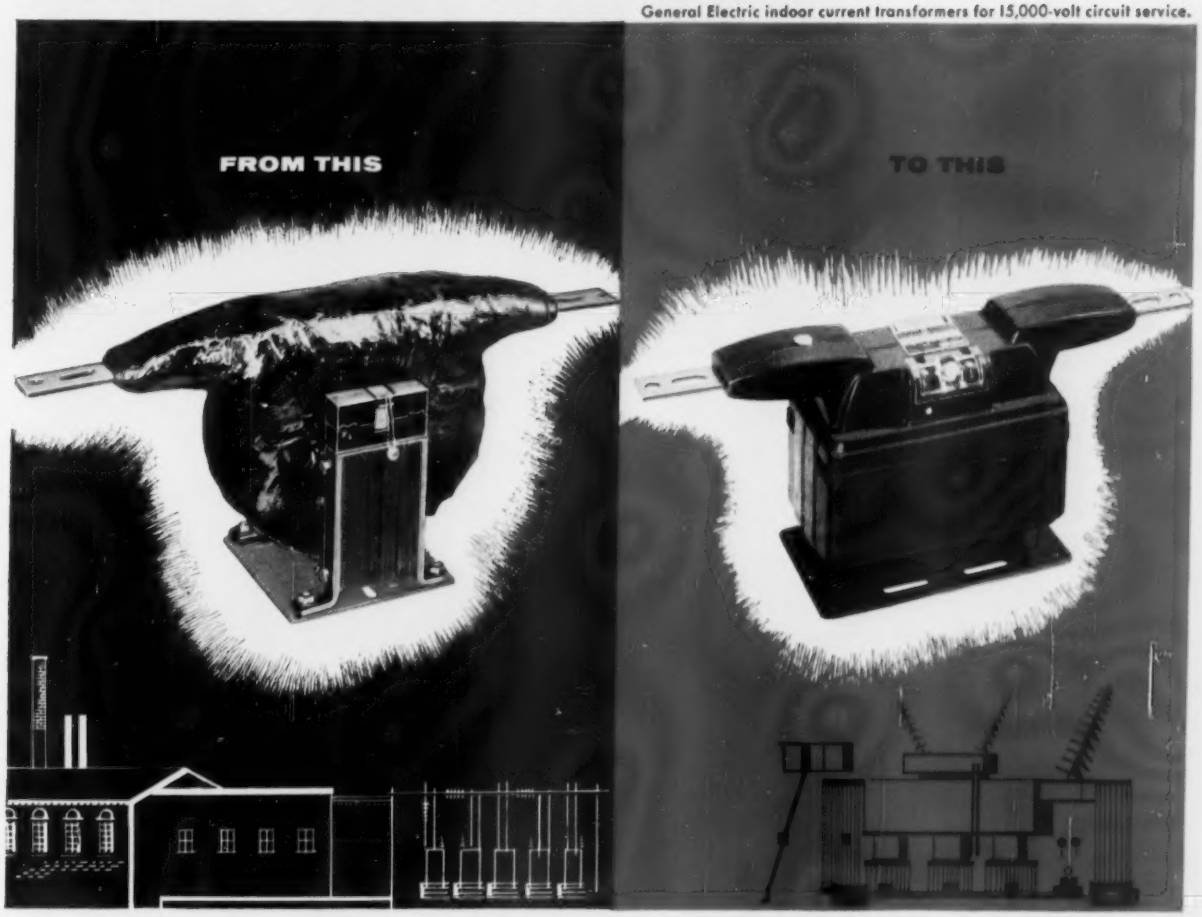

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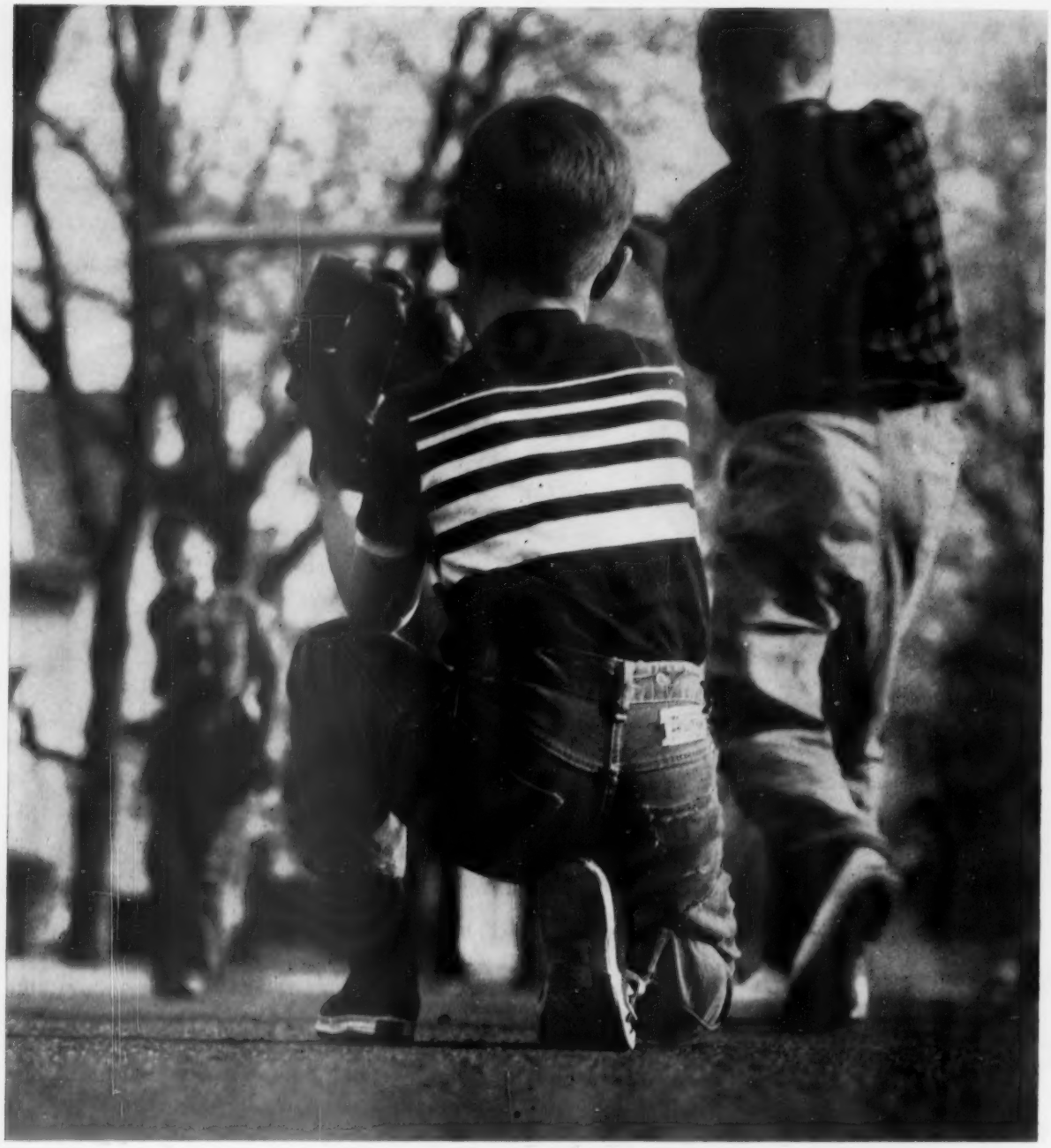

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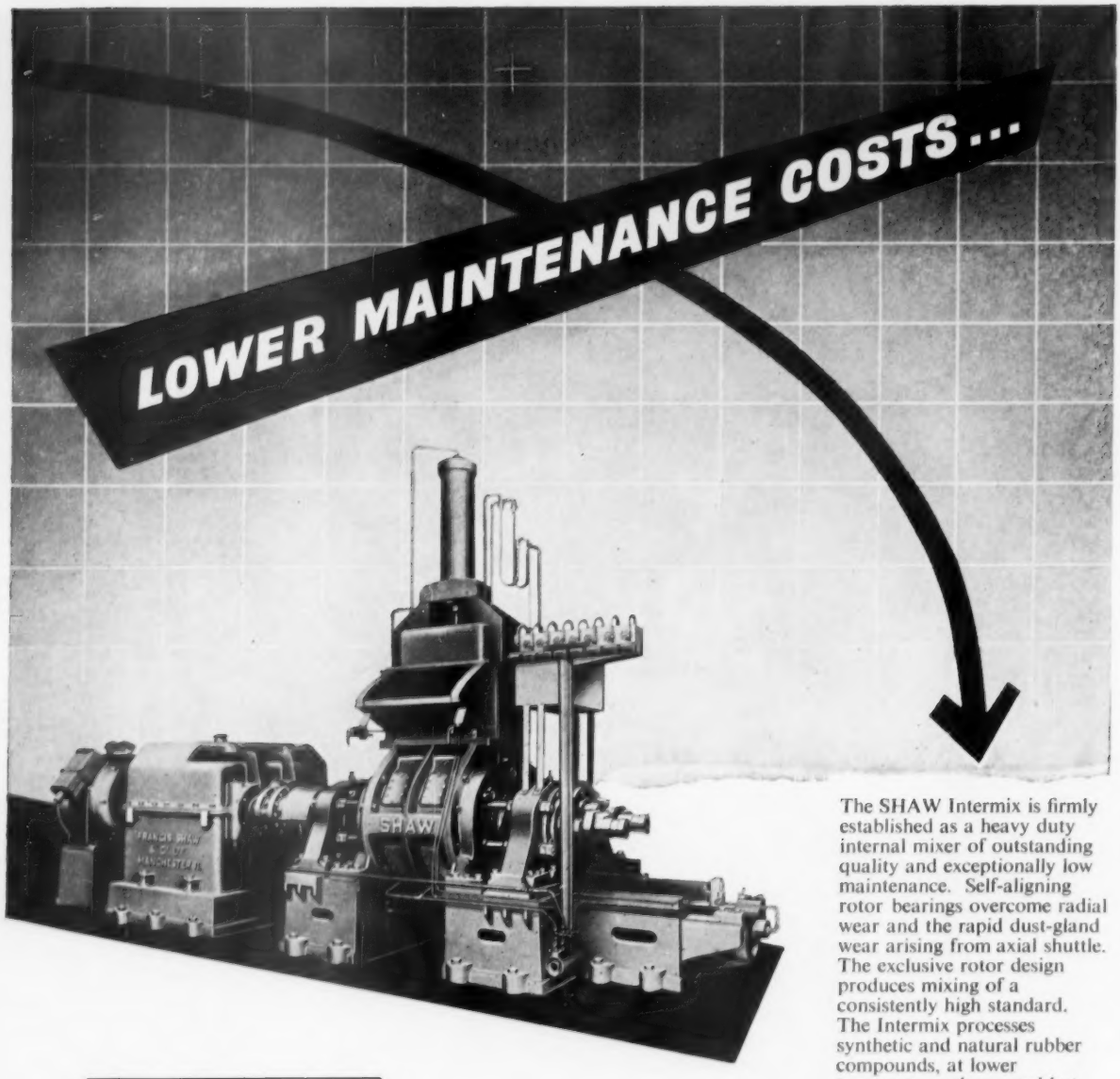

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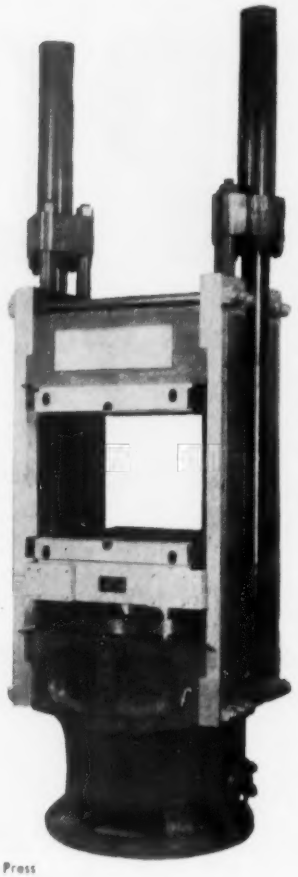

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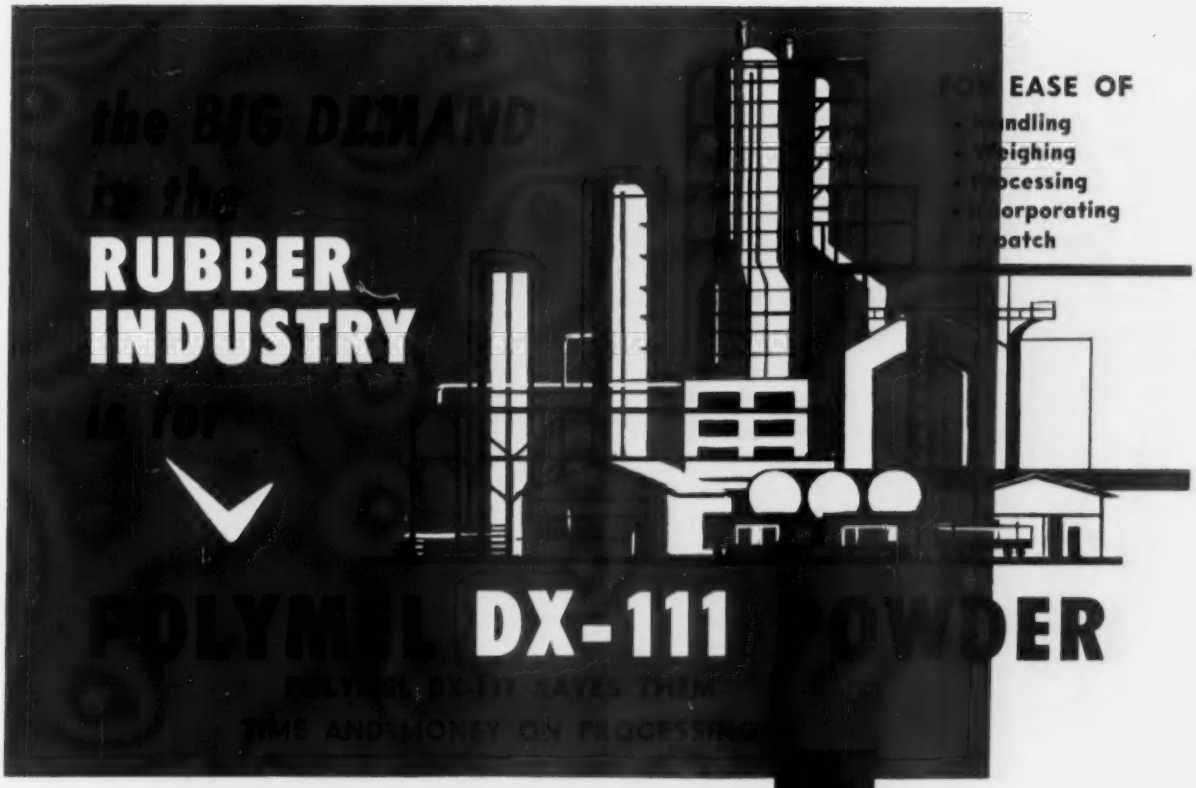

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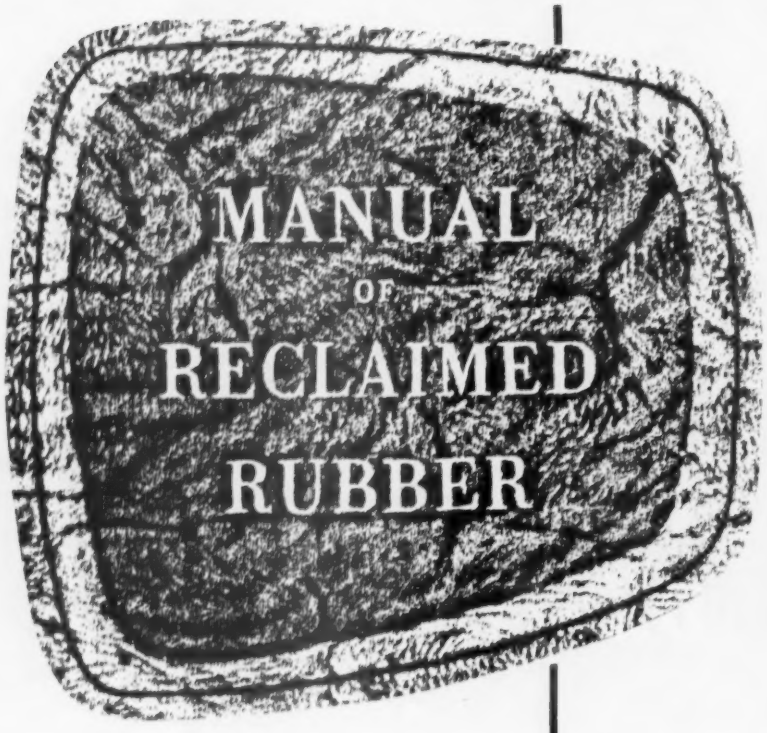

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VI—Appendix
VII—Index

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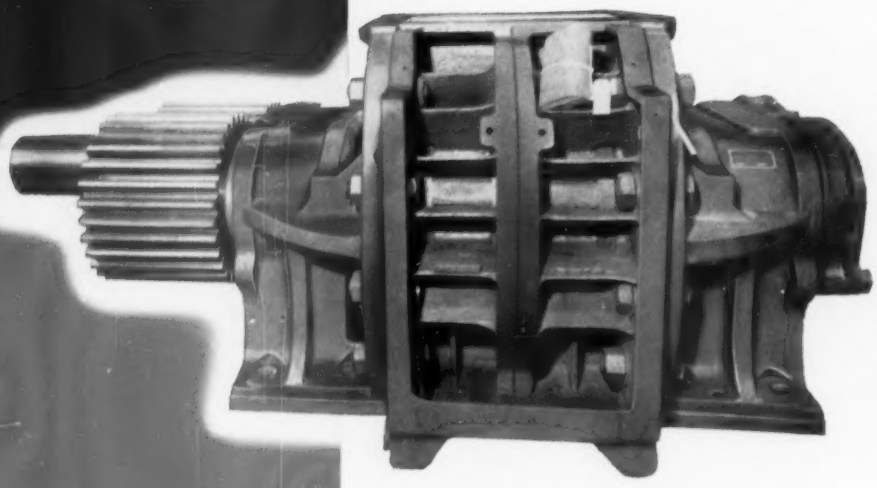

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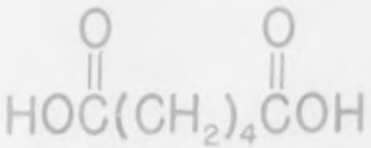

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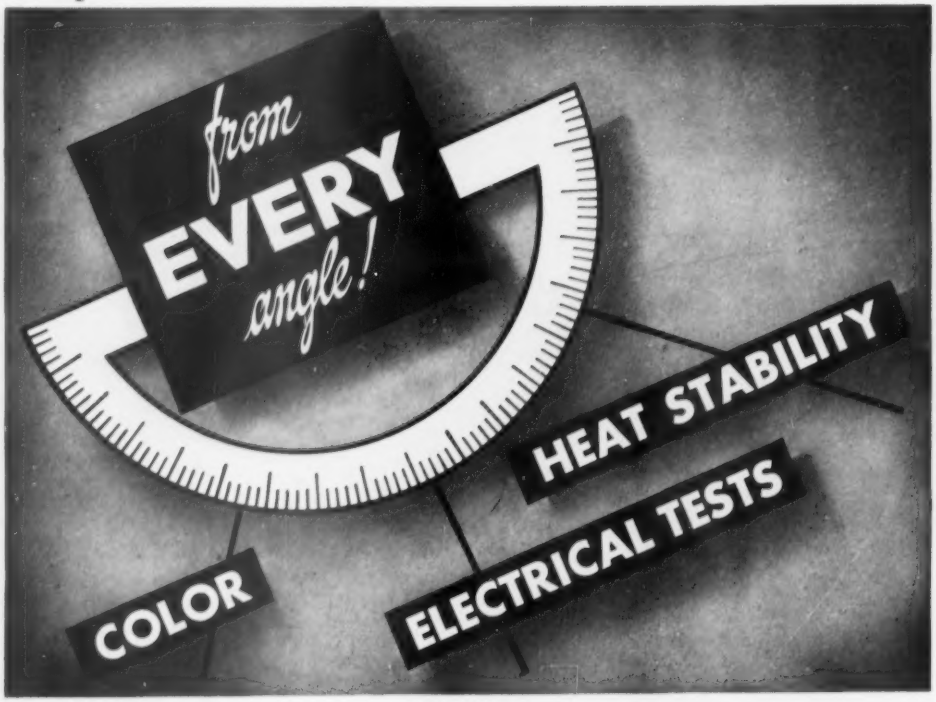

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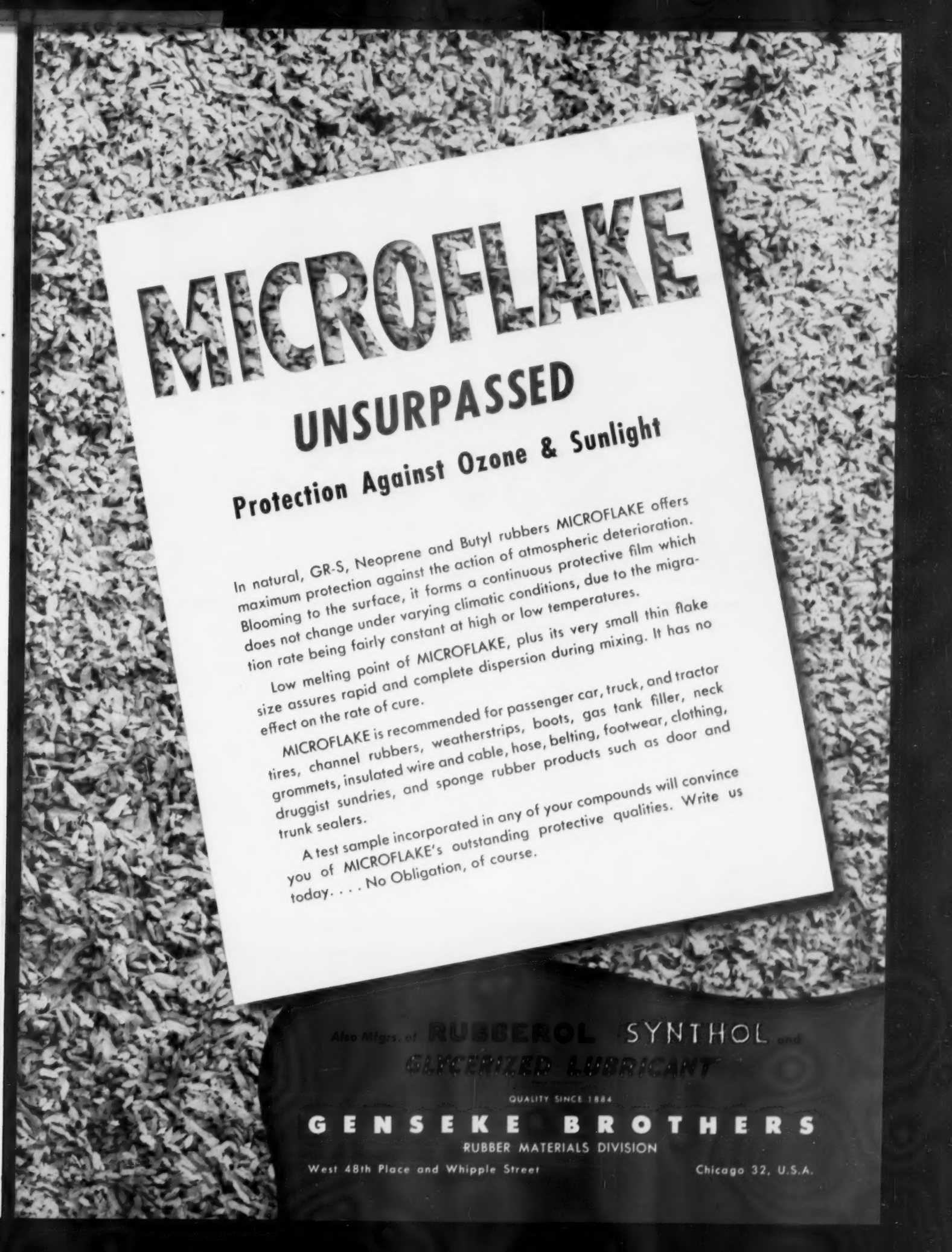
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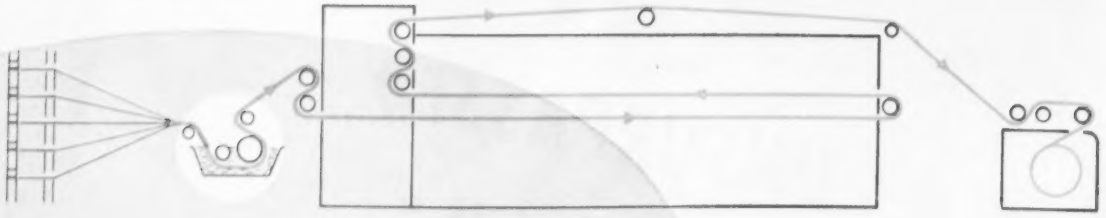

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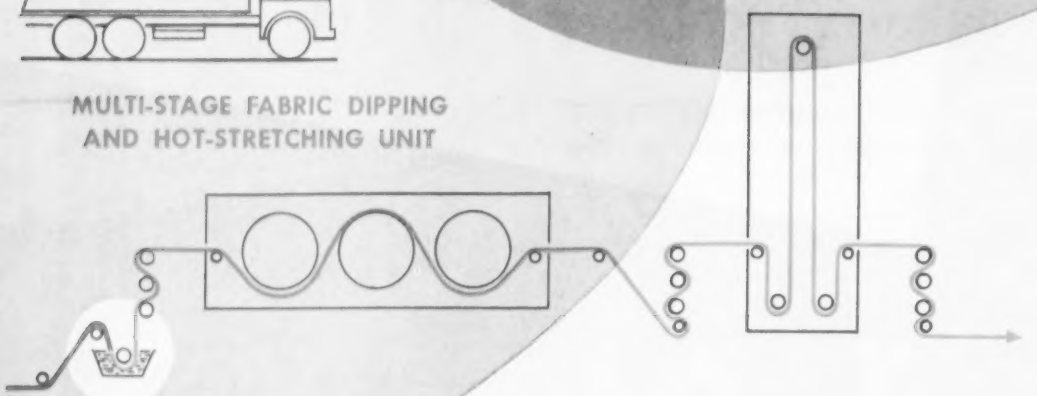

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HOT POLYMERS		
1000	General purpose hot rubber adaptable to most black products or products where color is unimportant.	Tires, molded and extruded mechanical goods, and many general purpose applications.
1001	More resistant to staining and discoloring than 1002.	Tires, molded and extruded mechanical goods, shoe soles and heels.
1002	Higher tensile and lower modulus in cured compounds than 1000 or 1001. Tends to slower curing, thus some adjustment might be necessary.	Tires, molded and extruded mechanical goods.
1006	Improved non-discoloring and non-staining polymer.	Light colored and white products such as white side-wall tires, shoe soles, floor tile, toys, etc.
1007	A glue-acid coagulated staining polymer with relatively low water absorption, low ash, and improved electrical properties.	Wire and cable insulation, electrical matting, gaskets, hard rubber products, etc.
1009	Non-staining cross-linked polymer. Use of small quantities with other type polymers effectively reduces shrinkage and die-swell in calender and extrusion operations.	Wherever control of shrinkage is important—footwear, wire and cable insulation, calendered sheet goods, camelback, soles and heels.
COLD NON-OIL POLYMERS		
1500	General purpose cold rubber where color and staining is unimportant.	Tires, camelback, molded and extruded mechanical goods.
1501	Same as 1500 except slightly staining stabilizer which permits use in some darker colored products.	Tires, molded mechanical goods.
1502	Relatively non-discoloring and non-staining cold rubber.	Light colored and white products such as white sidewall tires, white and light colored mechanical goods, floor tile, hospital sheeting, toys, shoe soles and heels.
COLD OIL-EXTENDED POLYMERS		
1703	General purpose relatively non-discoloring, non-staining polymer containing 25 parts oil. Presence of naphthenic oil may affect stain characteristics.	Light colored and white products—tires, mechanical goods, floor tile, hospital sheeting, toys, shoe soles and heels.
1705	General purpose polymer containing 25 parts aromatic oil for use where staining, discoloring is unimportant.	Tires, camelback, molded and extruded mechanical goods.
1707	Similar to 1703 but for 37.5 parts naphthenic oil, and emulsified with rosin soap rather than mixed soaps.	Tires, camelback, shoe soles and heels, molded and extruded mechanical goods.
1708	Relatively non-discoloring, non-staining polymer containing 37.5 parts naphthenic oil. Glue acid coagulation provides lower water absorption and improved electrical properties.	Wire and cable insulation, athletic goods, coated fabrics, molded and extruded mechanical goods.
1710	Similar to 1705 except for 37.5 parts of an aromatic oil.	Tires, camelback, molded and extruded goods.
1712	General purpose oil extended for use where color is unimportant. 37.5 parts high aromatic oil.	Tires, camelback, molded and extruded mechanical goods, wire and cable insulation.

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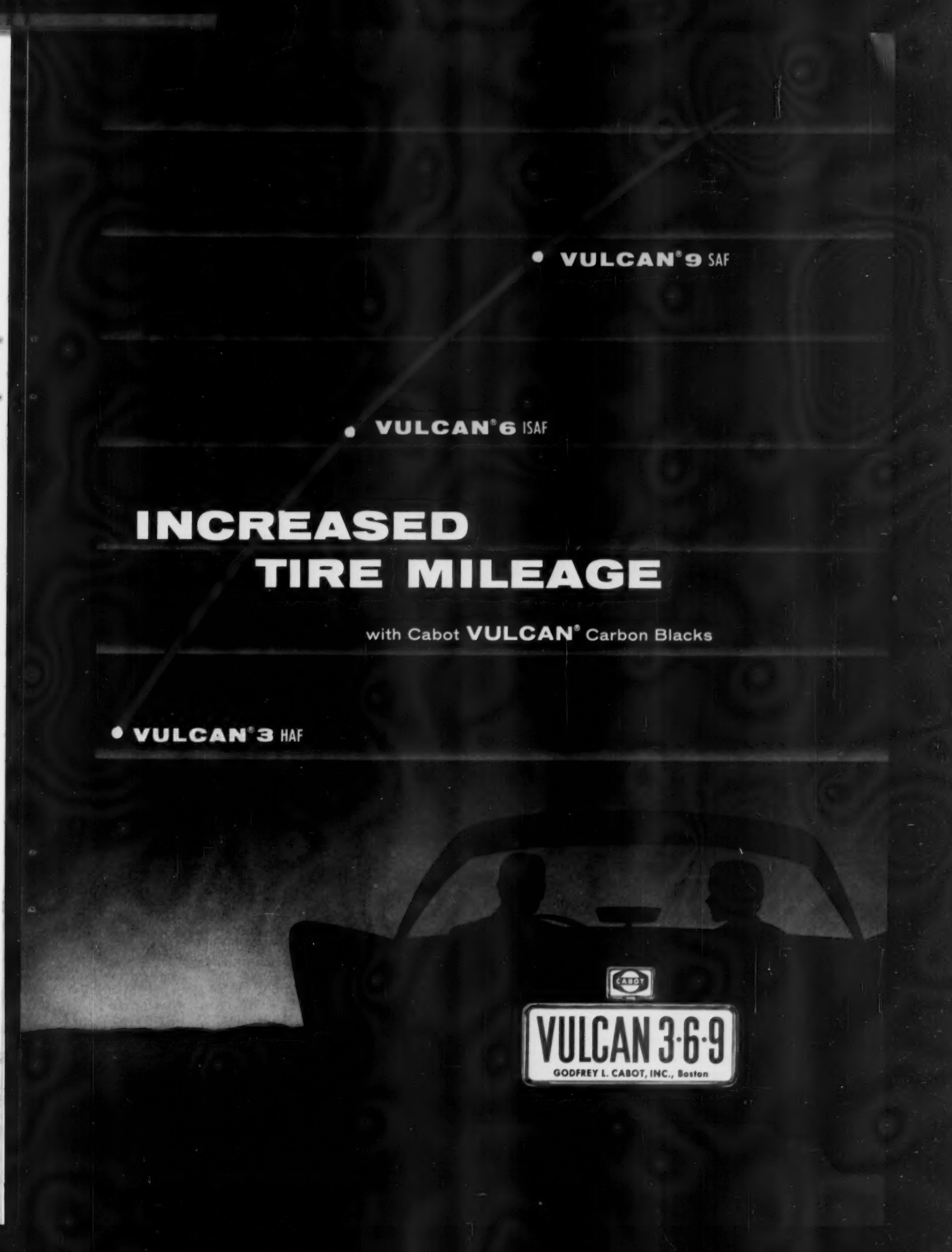
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US RUBBER

Rubber Age

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Compounding Rubbers for Resistance to Silicate-Ester Fluids

Part 1: Neoprene WRT

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Research in the development of practical rubber compounds to be used in contact with silicate-ester type hydraulic fluids at 400°F. is described

THE object of the research described in this paper was to develop practical rubber compounds that could be used in contact with silicate-ester fluids that have been developed as potential hydraulic fluids for supersonic aircraft. Such compounds were desired principally for application as packings and hose and should remain functional for long periods of time. Specific target properties were set up by the Wright Air Development Center, which sponsored this research, as indicative of the usability of rubber for this application. The following properties were desired before and after immersion for 500 hours in silicate-ester fluids at 400°F.:

Physical Property	Before	After 500 Hours
Tensile strength, psi (min)	1500	800
Elongation, per cent (min)	200	100
Hardness, Shore A	60-80	60-85
Low Temperature flexibility, °F.	—65	—65
Volume change		+5 to +30

Three silicate-ester base fluids were employed as test fluids for this research. These were OS-45 (Monsanto Chemical Co.), MLO-8200 (Oronite Chemical Co., originally developed on an Air Force contract by the California Research Corp.), and an 85/15 blend of MLO-8200 and Monoplex DOS [di-(2-ethylhexyl) sebacate, produced by Rohm and Haas Co.]. An important characteristic of all these fluids is their stability at temperatures too high for most hydraulic fluids, especially those that are derived from petroleum.

A number of rubber polymers were evaluated for their resistance to the above-mentioned synthetic hydraulic fluids. This is the first of two papers on this subject, and will be limited to studies made with Neoprene WRT. A second paper will describe studies made with other polymers (nitrile, vinyl pyridine, butyl and acrylate types) for this same application. Throughout both papers a number of proprietary materials are mentioned by name. However, there is no intent by the authors to imply or infer that comparable materials by other suppliers would not necessarily give similar results. It is recognized that some of these materials were evaluated under conditions far beyond their intended use. Therefore, in instances where poor results were obtained, this

should not reflect on their quality or performance for other less demanding applications.

The rubber polymers were milled, cured, and dumbbell specimens were prepared, following ASTM Methods D15-52T and D412-51T as closely as possible. Curing was done in four-cavity molds, with individual cavities 6 x 6 x 0.40 inches. Samples were died out with ASTM Die D.

Aging and Testing Procedures

The hot-oil aging of rubber specimens was carried out in an aluminum block heater, drilled to contain 60 test tubes *(1)*. The individual samples were suspended on stainless steel wire hangers in 25 x 200 mm. culture tubes sealed with aluminum caps containing liners made of vulcanized poly-FBA rubber.

The aging procedure consisted of suspending three dumbbells in a culture tube, adding 50 ml. of hydraulic fluid, sealing the tube, and placing it in the aluminum block heater for the desired length of time. When the various aging periods were completed, the tubes were removed from the heater and allowed to cool for one hour. The rubber specimens were then removed from the hydraulic fluid, dipped quickly in acetone to clean the surface, and blotted dry.

Stress-strain properties were determined with a Scott Tensile Tester, Model L-6, run at 20 inches per minute. Hardness was determined by a Shore A2 Durometer, according to ASTM Method D314-52T. Swell measurements were made with a Kraus-Jolly balance. The degree of cracking was rated visually after bending the specimens 180 degrees and rolling them. The arbitrary scale employed was (1) no cracking, (2) cracking, and (3) edge cracking. Edge cracking refers to cases where samples were cracked only at the edges, if these cracks did not grow across the sample as the specimen was rolled. Brittle point was determined by a solenoid-actuated tester, according to ASTM Method D746-54T. Temperature-retraction tests were made according to ASTM Method D1329-54T.

Neoprene WRT

Preliminary work conducted by Kitts at the Materials Laboratory, Wright Air Development Center *(2)*, indicated that Neoprene WRT showed considerable promise for this application. Thus, when Battelle undertook this assignment, first consideration was given to the potentialities of this polymer. The best WADC recipe at that time was identified in Kitts' report as 453-26C. It is also shown in Table I of the present paper as Recipe N-3. This composition maintained the desired target properties in only one fluid (the 85/15 blend) for 72 hours. This was much too short a time for the compound to be considered practical, but the composition was found to be a good starting point for the present study.

Kitts found in his work that best results were obtained by balancing rubber and fluid properties. Thus, the addition of 15 parts of dioctyl sebacate (DOS) to 85 parts of MLO-8200 reduced the tendency of neoprene to harden during hot-oil aging, and also improved its low-temperature flexibility. Diesters, such as DOS, probably also contribute to the lubricity of the blend, since certain diesters have been developed as high-temperature lubricants for aircraft. Several references on their development for this application are given in a previous paper *(3)*. Diesters tend to swell rubber more than silicate esters do, and thus are better plasticizers for rubber than the silicate esters. Both MLO-8200 and OS-45 are presumed to be formulated fluids and may already contain additives of this type as lubricity agents.

Preliminary Neoprene WRT Compounds

The results of aging three neoprene compounds are shown in Table I. Their recipes were selected from the following sources: Du Pont literature (N-2), WADC formulation (N-3), and from previous experience at Battelle (N-4). Of these recipes, N-3 gave the best results, although it retained adequate physical properties for only 72 hours in only the fluid blend. Recipe N-2 did equally well in this one fluid, but, being unplasticized, would probably fail to meet the low-temperature requirement. Recipe N-4 contained too much plasticizer, as is shown by the excessively low swell results. A small, positive swell is needed in most rubber packing materials to maintain an adequate seal.

Particular attention is directed to the cracking of these and subsequent neoprene compounds. The initial results show that the samples survived 72 hours without cracking, but at the end of 168 hours they cracked when bent at 180 degrees in the test. While it might be thought that samples aged long enough to fail in the cracking test would have very low tensile strength, this is not always the case. In fact, hardening of the rubber is often associated with an increase in tensile strength. However, large increases in tensile strength during aging usually occur at the expense of considerable loss in elongation, an important factor in the cracking of a rubber sample when it is bent double. There may be certain applications, such as static seals, where flex and crack resistance of rubber would not be critical. However, in considering rubber compositions for dynamic applications in hydraulic systems, prime consideration should be given to freedom from cracking, and other properties considered secondary.

The Effects of Zinc Oxide

Work reported by Kitts *(2)* indicated that the zinc oxide level was an important factor in Neoprene WRT compositions aged in sealed tubes at high temperatures. His findings suggested that 2.5 phr of zinc oxide should produce the best results. On the other hand, DuPont technical information and previous experience at Battelle indicated that higher loadings of zinc oxide might improve the aging of neoprene, at least at temperatures up to 300°F. Therefore, a study was made of this factor, with results shown in Table II.

Improved resistance to cracking was found in compositions containing high amounts of zinc oxide (60 to 80 phr) and small amounts of carbon black (30 phr), as shown in the results for Recipes N-33 and N-34. Samples of these compositions did not crack when flexed after aging for 168 hours in the fluid blend, while many of the other sample and fluid combinations failed to pass the test for cracking after aging for only 72 hours. High levels of both zinc oxide and carbon black produced compositions that were excessively hard and had low elongations after oil aging, which may have contributed

to their poor crack resistance. Subsequent variations in zinc oxide level, which will be described later, indicate that optimum results were obtained in a composition (N-101) having only 2.5 phr of zinc oxide. Thus, the optimum level of zinc oxide appears to be dependent on the composition and is not an independent variable.

The results were quite similar for aging rubber samples in OS-45 and in the blend of MLO-8200 and Monoplex DOS. Samples aged in MLO-8200 alone were more seriously degraded and, in several instances, blew the cap off the test tube, presumably due to gassing. The predominance of this occurrence for the samples aged in MLO-8200 indicates that the fluid must be a contributing factor. The addition of Monoplex DOS to MLO-8200 had a decidedly retarding effect on this occurrence, as well as on the change of the physical properties resulting from degradation of the rubber.

The Effects of Magnesia

The data in Table III were obtained in exploring the importance of magnesia content on the curing and aging of Neoprene WRT. Two levels of zinc oxide were used, and the carbon black loading adjusted to obtain a hardness of about 70. At a zinc oxide loading of 2.5 phr, the best balance of aged properties was obtained with 6 phr of magnesia, with larger amounts contributing to further loss in elongation and an extreme increase in hardness. However, as can be seen in the previous section of this paper on the effects of zinc oxide content, still better results were obtained with a magnesia content of 4 phr. Subsequent work indicated that about 4 phr is the best loading level for magnesia.

The series of compositions with 60 phr of zinc oxide and various levels of magnesia, shown also in Table III, demonstrate that at this higher zinc oxide level the magnesia content is less critical. Judging from these results, it would appear that cracking is more likely to occur in compositions high in magnesia and low in zinc oxide than in those that are high in zinc oxide and either high or low in magnesia. These results, however, may be shaded by the possible effect of reducing the carbon black content to adjust the hardness for the addition of the higher amounts of zinc oxide and magnesia. Note that Recipe N-64, high in both zinc oxide and magnesia, though slightly deficient in tensile strength after 72 hours of aging, gave good crack resistance after aging for 168 hours.

Accelerators Other than NA-22

Compositions containing several different accelerators are compared in Table IV. Many retained their tensile strength very well after aging, but none matched the one containing N-22 for retention of elongation, an important factor in crack resistance. An unusual feature of Recipes N-41 and N-43, containing Retarder W, is that their tensile strength and hardness first increased and then decreased with aging. In this investigation of Neoprene WRT, it has been much more common to observe further increases in tensile strength and hardness during aging. The tendency of these two compositions to soften, however, did not improve their elongations or their crack resistance. This shift in properties may be interpreted on the basis of cross-linking and chain scission reactions. Cross-linking promotes higher tensile strength, higher hardness, and lower elongation, while chain scission pro-

TABLE I—PRELIMINARY AGING STUDIES ON NEOPRENE WRT COMPOUNDS

Ingredients	Parts by Weight N-2	N-3	N-4
Base recipe			
Neoprene WRT	100	100	100
Magnesia ELC	2	4	4
Conlinex SRF		40	40
Thermax	80	40	40
Neozone A	2	—	3
Neozone D	—	—	2
Butyl oleate	—	15	—
Monoplex DOS	—	—	30
Zinc oxide	0.35	As shown	
NA-22	1.0		0.5

Cure: 30 minutes at 310°F.

Recipe	ZnO, phr	Original Physical Properties: Tensile Strength, psi	Elongation, %	Hardness, Shore A	Aging Time, hours	Physical Properties After Aging in Hydraulic Fluids at 400° F: OS-45: Tensile Strength, psi	Elongation, %	Hardness, Shore A	Swell, %	Cracking	MLO-8200/Monoplex DOS—85/15: Tensile Strength, psi	Elongation, %	Hardness, Shore A	Swell, %	Cracking	MLO-8200: Tensile Strength, psi	Elongation, %	Hardness, Shore A	Swell, %	Cracking
N-2	5	2570	250	76	72	710	90	75	24.7	None	1130	130	72	22.8	None	1390	70	85	16.4	Cracked
					168	190	40	71	56.8	Cracked	260	40	79	61.7	Cracked	130	10	85	60.1	Cracked
N-3	2.5	1920	200	73	72	860	60	80	12.2	None	1290	110	75	10.7	None	1490	90	83	1.8	None
					168	870	30	91	12.3	Cracked	1390	30	92	16.8	Cracked	2290	10	99	23.2	Cracked
N-4	25	1470	330	64	72	910	80	86	—4.8	None	750	90	77	—2.5	None	2440	10	98	—10.8	Cracked
					168	1230	40	95	2.3	Cracked	940	50	88	3.0	Cracked	Very brittle				

motes loss in all three of these properties. While cross-linking during aging is certainly objectionable, chain scission is even more deplorable because it leads to complete loss of rubber physical properties.

Nonblack Fillers

The results obtained by reinforcing Neoprene WRT with five different nonblack fillers are shown in Table V. After aging, these compositions had lower tensile strengths, but higher elongations than similar compositions reinforced with carbon black. The rubber hardness was little affected by aging, and no cracking was observed for many samples after 168 hours of aging in OS-45 or the fluid blend, with more cracking resulting in the samples aged in MLO-8200. Freedom from cracking was best in the compositions containing 1.0 phr of NA-22. Increasing the amount of NA-22 to 1.5 phr did not elevate the tensile strength of the aged samples, as was hoped, but tended to reduce elongation and aggravate the cracking problem. Additional variations in the compositions containing these same nonblack fillers will be discussed later in this paper.

Blends of Black and Nonblack Fillers

An effort was made to combine the desirable properties contributed to Neoprene WRT by black (high tensile strength) with those contributed by nonblack fillers (good elongation and crack resistance). The results obtained with several compositions containing both these types of fillers are shown in Table VI. While some of these blends displayed good crack resistance for 168 hours, these were the blends that had inferior tensile strength. Thus, there appeared to be no advantage to using both types of filler in the same composition.

Variation of Accelerator and Activator

In the final series of experiments, another approach was tried toward improving the aged tensile strength of Neoprene WRT containing several nonblack fillers. Table VII shows the results of making minor changes in the amounts of zinc oxide, magnesia, and NA-22 in these compositions. Within the concentration ranges studied, neither high nor low levels of the two oxides offered any advantage. However, when the amounts of zinc oxide and magnesia were 2.5 and 4.0 phr, respectively, there was an advantage to lowering the amount of NA-22 to 0.6 phr, as can be seen in the results for Recipe N-101. It will be recalled from Table V that better crack resistance was obtained with 1.0 phr NA-22 than with 1.5 phr of this same material. Further adjustments in NA-22 content might lead to still better performance, but it is not clear whether these adjustments should be to greater or smaller amounts of this material. However, it appears likely that a more precise pinpointing of the exact amount of NA-22 to give optimum results will indicate a range close to 0.6 phr.

Recipe N-101 gave better results than other Neoprene WRT compositions developed on this program. In fact, this composition was in better condition after 168 hours in silicate ester fluid at 400°F. than the majority of the other compositions aged under similar conditions for only 72 hours. Since considerable importance may be placed on retention of elongation during aging as a qualitative indication of crack resistance, an estimate was

TABLE II—THE EFFECT OF VARYING THE ZINC OXIDE ON THE AGING OF NEOPRENE WRT COMPOUNDS

Ingredients	Parts by Weight
Base recipe	100
Neoprene WRT	4
Magnesia ELC	As shown
Continex SRF	As shown
Thermax	As shown
Thermatomic P-33	15
Butyl oleate	As shown
Zinc oxide	0.5
NA-22	

Cure: 30 minutes at 310° F.
(a) NA-22 was increased to 1.0 phr.

Recipe	ZnO, phr	Carbon Black, phr			Original Physical Properties				Physical Properties After Aging in Hydraulic Fluids at 400°F.															
		SRF	Ther-max	P-33	Tensile Strength, psi	Elongation, %	Hardness, Shore A	Aging Time, hours	OS-45				85/15-MLO-8200/Monoplex				DOS				MLO-8200			
									Tensile Strength, psi	Elongation, %	Hardness, Shore A	Swell, %	Tensile Strength, psi	Elongation, %	Hardness, Shore A	Swell, %	Cracking	Tensile Strength, psi	Elongation, %	Hardness, Shore A	Swell, %	Cracking
N-20	0	40	40	—	1690	330	60	72	600	40	84	4.1	1360	80	82	5.5	Cracked	1230	50	89	—2.8	Cracked
								168	670	30	93	2.4	1040	30	91	5.6	Cracked	1240	20	97	0.5	Cracked
N-21	2	40	40	—	2170	220	71	72	780	70	80	9.7	890	80	77	8.0	None	1210	80	85	—0.4	None
								168	730	50	85	11.3	1930	40	97	4.2	Cracked	1120	30	96	12.8	Cracked
N-22	3	40	40	—	1810	200	72	72	730	70	80	8.1	750	80	77	8.7	None	1000	80	85	—0.8	Cracked
								168	550	40	85	21.4	1280	30	94	21.5	Cracked	8350	0	100	—2.7	Cracked

N-23	5	40	40	—	1900	200	72	72	730	70	77	6.5	None	790	80	75	8.0	None	1120	70	85	—0.8	Cracked
								168	330	40	85	40.4	Cracked	420	40	80	37.9	Cracked	310	20	87	—9.3	Cracked
N-24	10	40	40	—	1810	200	72	72	810	80	79	6.2	None	880	80	76	7.7	None	1170	80	85	—0.9	Cracked
								168	650	40	90	25.7	Cracked	230	30	80	13.5	Cracked	Cap blew off test tube				
N-25	20	40	40	—	1850	200	74	72	750	70	80	5.7	None	820	70	76	7.4	Cracked	1010	60	87	—0.8	Cracked
								168	810	40	92	6.9	Cracked	950	50	88	13.9	Cracked	Cap blew off test tube				
N-26	30	40	40	—	1840	200	74	72	760	70	81	4.6	Cracked	930	80	79	7.6	Cracked	1090	60	87	—1.5	Cracked
								168	890	40	91	4.7	Cracked	890	50	90	12.4	Cracked	910	0	100	—Very brittle—	
N-76	40	40	40	—	1790	210	73	72	990	90	82	5.4	None	980	80	81	9.0	None	1590	70	92	1.2	Cracked
								168	1390	60	92	4.9	Cracked	1320	50	94	14.7	Cracked	5130	10	100+	8.8	Cracked
N-77	60	40	40	—	1610	200	76	72	1350	70	90	6.8	Cracked	1370	60	92	13.4	Cracked	3650	20	100+	6.2	Cracked
								168	1260	20	99	16.4	Cracked	2290	20	99	27.6	Cracked	Cap blew off test tube				
N-78	80	40	40	—	1570	180	79	72	1630	60	93	8.5	Cracked	1510	60	93	13.0	Cracked	4860	10	100+	6.1	Cracked
								168	1590	10	99	20.9	Cracked	2630	20	100	27.1	Cracked	Too brittle to be tested				
N-79	100	40	40	—	1410	180	82	72	1710	60	95	8.5	Cracked	1450	60	94	11.7	Cracked	4380	10	100+	4.7	Cracked
								168	1570	10	99	15.3	Cracked	2280	20	99	24.0	Cracked	2000	0	100+	15.9	Cracked
N-5[a]	1	40	40	—	2170	210	67	72	650	30	86	8.0	Cracked	960	70	81	8.4	None	960	40	88	1.4	Cracked
								168	1370	20	95	2.6	Cracked	1180	30	92	8.1	Cracked	2720	10	100	6.7	Cracked
N-6[a]	2	40	40	—	2390	230	69	72	720	50	80	7.2	Cracked	1540	110	75	10.9	None	1520	90	83	2.3	None
								168	1370	20	94	5.4	Cracked	3450	10	100	6.1	Cracked	1790	20	96	16.8	Cracked
N-7[a]	3	40	40	—	2260	220	68	72	610	50	80	11.4	Cracked	1420	120	75	11.5	None	1750	80	86	4.9	None
								168	1310	20	93	10.2	Cracked	2950	10	99	13.3	Cracked	2230	20	99	22.4	Cracked
N-8[a]	10	40	40	—	2220	220	69	72	870	60	81	9.2	Cracked	1310	100	77	12.0	None	2740	30	98	10.3	Cracked
								168	Partially disintegrated					540	40	82	65.7	Cracked	Partially disintegrated				
N-9[a]	20	40	40	—	1950	210	70	72	1110	80	82	8.7	Cracked	1370	100	77	10.9	None	2430	50	97	1.5	Cracked
								168	1390	40	90	20.6	Cracked	1880	60	80	18.7	Cracked	Partially disintegrated				
N-80[a]	40	40	40	—	1690	210	74	72	1270	60	90	7.9	Cracked	1310	50	93	14.5	Cracked	5830	10	100+	6.5	Cracked
								168	1530	20	98	20.6	Cracked	2570	20	99	27.4	Cracked	Cap blew off test tube				
N-81[a]	60	40	40	—	1680	200	77	72	1980	60	95	11.5	Cracked	1310	50	92	13.5	Cracked	5710	10	100+	5.5	Cracked
								168	1510	10	99	20.8	Cracked	2790	20	100	31.2	Cracked	1520	0	100+	15.0	Cracked
N-82[a]	80	40	40	—	1530	190	79	92	1390	70	92	6.9	Cracked	1250	60	92	10.2	Cracked	3490	20	100+	3.4	Cracked
								168	1820	10	99	20.5	Cracked	1900	30	98	17.1	Cracked	1530	0	100+	18.6	Cracked
N-83[a]	100	40	40	—	1290	170	85	72	730	60	87	4.7	Cracked	1010	70	88	6.3	Cracked	1410	60	94	0.0	Cracked
								168	1390	50	95	6.0	Cracked	1500	40	97	13.8	Cracked	3550	10	100+	5.5	Cracked
N-32[a]	40	35	35	—	1950	250	71	72	1090	100	77	7.1	None	1180	240	70	0.7	None	2510	50	98	4.1	Cracked
								168	1430	60	87	6.0	Cracked	1560	70	87	18.2	Cracked	Fluid solidified				
N-33[a]	60	15	15	—	1540	300	69	72	720	120	70	6.1	None	1390	120	75	10.8	None	1450	140	79	—0.8	None
								168	810	80	81	4.0	Cracked	1160	90	81	15.1	Cracked	5310	10	100	16.2	Cracked
N-34[a]	80	15	15	—	1540	370	66	72	670	150	66	6.0	None	930	150	69	9.6	None	1670	140	79	—0.4	None
								168	930	90	82	3.5	Cracked	890	100	79	15.0	None	4630	10	100	15.9	Cracked
N-35[a]	100	0	0	—	1350	590	58	72	290	180	58	7.4	None	420	280	56	11.5	None	1180	240	70	0.7	None
								168	290	90	70	3.2	Cracked	600	120	72	20.1	None	3990	10	100	26.1	Cracked
N-73[a]	60	—	—	100	1350	240	77	72	970	70	86	6.0	Cracked	990	80	84	8.1	None	1420	50	95	0.7	Cracked
								168	1500	20	100	17.1	Cracked	2690	10	100+	29.2	Cracked	Too brittle to be tested				
N-74[a]	80	—	—	100	1280	230	80	72	950	70	86	6.0	Cracked	1070	80	87	8.2	Cracked	1560	50	96	2.0	Cracked
								168	1730	20	99	14.1	Cracked	2030	30	98	18.8	Cracked	2940	0	100+	13.7	Cracked
N-75[a]	100	—	—	100	1140	210	81	72	1210	70	91	5.5	Cracked	1080	70	89	9.2	Cracked	1590	70	92	1.2	Cracked
								168	1460	40	97	4.6	Cracked	1500	40	97	13.2	Cracked	4690	10	100+	4.8	Cracked

TABLE III—THE EFFECTS OF VARYING THE MAGNESIA CONTENT ON THE AGING OF NEOPRENE WRT COMPOUNDS

Base recipes

Ingredients	Parts by Weight N-51 to N-56	N-57	N-58 to N-63	N-64
Neoprene WRT	100	100	100	100
Magnesia ELC	As shown	As shown	As shown	As shown
Thermatomic P-33	110	80	40	20
Butyl oleate	15	15	15	15
Zinc oxide	2.5	2.5	60	60
NA-22	1.0	1.0	1.0	1.0

Cure: 30 minutes at 310°F.

	Original Physical Properties						Physical Properties After Aging in Hydraulic Fluids at 400°F.														
							OS-45					85/15-MLO-8200/Monoplex DOS					MLO-8200				
Recipe	Magnesia, phr	Zinc Oxide, phr	Tensile Strength, psi	Elongation, %	Hardness, Shore A	Aging Time, hours	Tensile Strength, psi	Elongation, %	Hardness, Shore A	Swell, %	Cracking	Tensile Strength, psi	Elongation, %	Hardness, Shore A	Swell, %	Cracking	Tensile Strength, psi	Elongation, %	Hardness, Shore A	Swell, %	Cracking
N-51	0	2.5	1570	380	69	72	860	70	83	2.7	Cracked	1430	90	81	2.3	None	1750	80	92	—3.4	Cracked
						168	990	20	97	1.2	Cracked	6200	0	100+	—3.8	Cracked	2870	0	100+	0.4	Cracked
N-52	2	2.5	1530	300	72	72	940	80	82	7.7	None	1590	130	77	7.6	None	1730	90	90	0	None
						168	1380	30	93	8.3	Cracked	4230	0	100+	7.8	Cracked	4730	0	100+	4.1	Cracked
N-53	6	2.5	1530	270	72	72	1220	80	86	7.7	Cracked	1360	110	81	7.1	None	1690	90	89	—0.7	None
						168	1340	50	92	11.4	Cracked	1470	60	90	14.2	Cracked	1490	30	95	16.5	Cracked
N-54	10	2.5	1660	230	75	72	1130	70	88	8.8	Cracked	1330	80	87	10.0	Cracked	1530	70	92	1.9	Cracked
						168	1670	40	95	13.6	Cracked	1930	40	98	11.0	Cracked	2030	40	98	10.4	Cracked
N-55	20	2.5	1670	260	74	72	1030	70	88	8.7	Cracked	1280	90	86	9.5	Cracked	1530	80	91	—0.2	Cracked
						168	1490	40	95	14.3	Cracked	1350	50	94	14.4	Cracked	1940	40	97	11.2	Cracked
N-56	30	2.5	1690	260	75	72	1190	80	89	8.5	Cracked	1390	90	88	10.1	None	1670	80	94	1.1	Cracked
						168	1790	40	98	15.6	Cracked	1780	60	97	15.1	Cracked	1830	50	97	10.5	Cracked
N-57	50	2.5	1730	330	72	72	920	60	91	9.3	Cracked	940	80	88	10.8	Cracked	1070	60	91	0.9	Cracked
						168	1510	40	98	15.8	Cracked	1650	40	99	15.9	Cracked	1450	40	97	10.1	Cracked
N-58	0	60	1530	490	62	72	410	120	71	4.6	None	710	170	65	6.3	None	950	120	79	—1.8	None
						168	600	60	88	5.4	Cracked	1050	70	85	14.4	Cracked	5070	0	100+	15.6	Cracked
N-59	2	60	1330	410	63	72	530	120	70	4.9	None	830	190	65	9.1	None	1540	140	81	0	None
						168	900	80	86	6.3	Cracked	1280	90	85	17.9	Cracked	5270	0	100+	12.9	Cracked
N-60	6	60	1460	430	65	72	590	130	71	6.3	None	550	130	69	10.8	None	1050	140	77	0.9	None
						168	1010	70	84	7.6	Cracked	1250	70	88	19.1	Cracked	4850	0	100+	19.9	Cracked
N-61	10	60	1370	390	67	72	670	130	70	6.0	None	790	160	70	10.1	None	1590	140	81	1.4	None
						168	790	80	82	4.9	Cracked	1310	90	86	17.3	Cracked	5680	0	100+	14.3	Cracked
N-62	20	60	1490	380	68	72	670	120	74	7.2	None	770	140	75	10.6	None	1050	130	80	0.7	None
						168	1350	70	88	6.1	Cracked	1210	80	88	17.4	Cracked	2890	10	100	13.7	Cracked
N-63	30	60	1570	370	70	72	790	120	76	8.0	None	840	150	76	10.3	None	1120	100	85	0.7	None
						168	1230	80	91	8.4	Cracked	1240	70	90	15.0	Cracked	3190	10	100+	15.2	Cracked
N-64	50	60	1540	440	71	72	710	130	75	10.1	None	790	180	75	12.5	None	930	120	83	2.2	None
						168	1160	90	90	10.5	None	1190	90	91	17.3	None	2390	10	100+	13.8	Cracked

TABLE IV—THE EFFECTS OF SEVERAL ACCELERATORS ON THE AGING OF NEOPRENE WRT COMPOUNDS

Base recipes

Ingredients	Parts by Weight N-50	Parts by Weight All Others
Neoprene WRT	100	100
Magnesia ELC	4	4
Thematomic P-33		110
Silene EF	60	
Butyl oleate	15	15
Zinc oxide	As shown	As shown
Accelerator	As shown	As shown

Cure: 30 minutes at 310°F.

(a) TEPA = Tetraethylene pentamine.

				Original Physical Properties				Physical Properties After Aging in Hydraulic Fluids at 400°F.													
								OS-45					85/15-MLO-8200/Monoplex DOS					MLO-8200				
Recipe	Accelerator Name	Accelerator Phr	ZnO, phr	Tensile Strength, psi	Elongation %	Hardness, Shore A	Aging Time, hours	Tensile Strength, psi	Elongation, %	Hardness, Shore A	Swell, %	Cracking	Tensile Strength, psi	Elongation, %	Hardness, Shore A	Swell, %	Cracking	Tensile Strength, psi	Elongation, %	Hardness, Shore A	Swell, %	Cracking
N-15	NA-22	1.0	2.5	1630	300	69	72	1270	90	80	8.0	None	1590	130	78	9.6	None	1830	100	88	1.0	None
							168	1610	40	93	9.3	Cracked	1610	70	90	7.5	Cracked	3630	10	100	16.4	Cracked
N-36	Permalux	1.5	2.5	1030	390	69	72	970	80	82	10.4	Cracked	1300	80	86	18.3	Cracked	1410	40	97	25.3	Cracked
							168	960	40	92	10.6	Cracked	1620	30	97	19.5	Cracked	—Brittle—		—100+	6.7	—
N-37	Permalux	1.5	5	1110	350	70	72	990	60	89	11.3	Cracked	860	60	91	35.2	Cracked	—Cap blew off tube—				—
							168	440	40	85	24.1	Cracked	910	40	93	32.1	Cracked	—Fluid solidified—				—
N-38	Permalux	2.0	2.5	1060	390	70	72	920	80	84	10.7	Cracked	1110	70	86	26.6	Cracked	1540	30	98	25.6	Cracked
							168	890	40	91	11.7	Cracked	1210	10	100+	30.8	Cracked	1340	0	100	26.7	Cracked
N-39	Permalux	2.0	5	1070	380	70	72	990	70	88	10.0	Cracked	1190	70	89	24.7	Cracked	1840	20	98	21.7	Cracked
							168	500	40	86	19.8	Cracked	770	30	92	31.3	Cracked	—Cap blew off tube—				—
N-40	Retarder W	1.5	2.5	1420	490	63	72	1340	100	81	13.7	None	1250	120	75	19.7	None	1950	40	98	21.0	Cracked
							168	1230	50	89	11.7	Cracked	2040	30	96	18.6	Cracked	1750	30	97	26.1	Cracked
N-41	Retarder W	1.5	5	1450	490	63	72	1680	110	85	8.5	None	2030	130	80	13.8	None	1640	30	98	29.3	Cracked
							168	1010	60	85	15.3	Cracked	870	40	83	37.5	Cracked	1660	0	100	17.0	Cracked
N-42	Retarder W	2	2.5	1410	510	65	72	1070	100	81	13.5	None	1330	130	72	17.7	None	1640	30	98	18.3	Cracked
							168	1170	40	89	10.2	Cracked	3470	10	100	12.5	Cracked	2780	10	100	21.8	Cracked
N-43	Retarder W	2	5	1390	500	65	72	1770	120	83	10.7	None	1980	140	80	10.8	None	1200	30	94	28.9	Cracked
							168	560	50	79	27.1	Cracked	760	50	76	36.5	Cracked	1770	10	99	29.5	Cracked
N-48	TEPA[a]	1.5	0	1830	240	75	72	1070	40	93	5.4	Cracked	1070	50	89	6.6	Cracked	1560	50	94	—1.8	Cracked
							168	1190	20	97	6.2	Cracked	1510	10	97	7.1	Cracked	1580	30	97	5.1	Cracked
N-49	TEPA	1.5	2.5	1750	290	70	72	1190	70	90	7.5	Cracked	1570	90	85	7.3	None	1620	70	91	—1.2	Cracked
							168	1120	40	93	12.4	Cracked	1170	50	90	12.3	Cracked	1670	30	96	9.6	Cracked
N-50	TEPA	1.5	0	1020	600	73	72	530	50	80	0	Cracked	650	130	75	3.0	None	830	130	83	—5.2	Cracked
							168	1010	20	97	—2.8	Cracked	800	40	91	—1.3	Cracked	960	50	93	—7.5	Cracked

TABLE V—THE EFFECTS OF NONBLACK FILLERS ON THE AGING OF NEOPRENE WRT COMPOUNDS

Base recipe

Ingredients	Parts by Weight
Neoprene WRT	100
Magnesia ELC	4
Filler	As shown
Butyl oleate	15
Zinc oxide	2.5
NA-22	As shown

Cure: 30 minutes at 310°F.

				Original Physical Properties				Physical Properties After Aging in Hydraulic Fluids at 400°F.														
								OS-45					85/15-MLO-8200/Monoplex DOS					MLO-8200				
Recipe	Filler Material	Phr	NA-22, phr	Tensile Strength, psi	Elongation, %	Hardness, Shore A	Aging Time, hours	Tensile Strength, psi	Elongation, %	Hardness, Shore A	Swell, %	Cracking	Tensile Strength, psi	Elongation, %	Hardness, Shore A	Swell, %	Cracking	Tensile Strength, psi	Elongation, %	Hardness, Shore A	Swell, %	Cracking
N-10	Valron Estersil	45	1.0	2010	640	69	72	440	200	66	23.3	None	750	280	76	25.4	None	990	260	82	10.3	None
							168	90	90	53	35.5	None	470	90	67	40.1	None	1090	0	97	42.0	Cracked
N-11	Calcene NC	60	1.0	1790	630	54	72	390	170	58	10.1	None	550	250	56	10.5	None	650	210	64	—1.9	None
							168	520	90	70	7.2	None	630	120	72	11.3	None	510	100	68	—0.3	None
N-12	Hi-Sil C	60	1.0	1600	600	81	72	610	110	85	4.4	None	820	170	85	4.9	None	—	—	—	—	—
							168	810	110	91	4.8	None	730	130	90	7.4	None	—	—	—	—	—
N-13	Cab-O-Sil	45	1.0	2400	620	73	72	970	160	88	9.4	None	1050	210	85	12.8	None	1350	170	89	1.6	None
							168	550	90	80	24.9	None	660	130	75	26.6	None	890	10	96	28.3	Cracked
N-14	Silene EF	60	1.0	1400	600	66	72	450	130	65	7.4	None	530	190	61	10.5	None	860	180	72	—3.3	None
							168	450	100	68	5.9	None	590	160	66	10.0	None	750	140	74	—1.9	None
N-27	Valron Estersil	45	1.5	2010	620	74	72	270	200	58	20.7	None	380	230	57	20.1	None	730	260	69	5.6	None
							168	580	130	80	27.6	None	530	130	76	32.1	None	930	140	88	17.8	None
N-28	Calcene NC	70	1.5	1650	610	61	72	320	110	65	8.0	None	370	130	62	10.3	None	570	130	68	—2.1	None
							168	570	70	80	11.2	Cracked	570	80	76	12.2	Cracked	570	80	78	—0.7	Cracked
N-29	Hi-Sil C	50	1.5	1890	570	73	72	560	150	70	9.8	None	670	180	68	10.7	None	740	140	80	0.6	None
							168	760	80	87	11.2	Cracked	600	100	85	14.2	None	840	90	90	3.4	Cracked
N-30	Cab-O-Sil	45	1.5	2150	580	77	72	790	190	77	3.5	None	790	190	77	7.7	None	990	180	85	—3.5	None
							168	850	70	96	12.7	Cracked	850	100	91	14.9	None	1080	70	97	1.6	Cracked
N-31	Silene EF	60	1.5	1270	530	76	72	530	120	75	5.1	None	520	130	71	7.2	None	570	110	78	—2.8	None
							168	470	80	78	5.3	None	420	80	76	7.5	Cracked	570	70	85	—2.6	Cracked

TABLE VI—THE EFFECTS OF BLENDING CARBON BLACK AND NONBLACK FILLERS ON THE AGING OF NEOPRENE WRT COMPOUNDS

Base recipe

Ingredients	Parts by Weight
Neoprene WRT	100
Magnesia ELC	4
Nonblack filler	As shown
Thermatomic P-33	As shown
Butyl oleate	15
Zinc oxide	2.5
NA-22	1.0

Cure: 30 minutes at 310°F.

					Original Physical Properties				Physical Properties After Aging in Hydraulic Fluids at 400°F.														
									OS-45					85/15-MLO-8200/Monoplex DOS					MLO-8200				
Recipe	Nonblack Filler Type	Phr	P-33, phr	Tensile Strength, psi	Elongation, %	Hardness, Shore A	Aging Time, hours	Tensile Strength, psi	Elongation, %	Hardness, Shore A	Swell, %	Cracking	Tensile Strength, psi	Elongation, %	Hardness, Shore A	Swell, %	Cracking	Tensile Strength, psi	Elongation, %	Hardness, Shore A	Swell, %	Cracking
N-44	Calcene NC	35	55	1430	420	61	72	610	90	77	9.1	None	700	110	74	8.6	None	830	110	77	—1.2	None
							168	800	50	87	9.6	Cracked	710	50	87	11.2	Cracked	810	50	88	1.5	Cracked

N-45	Hi-Sil C	25	55	1540	360	70	72	560	80	82	7.4	Cracked	650	100	79	7.1	None	710	80	88	—1.2	Cracked
							168	840	50	93	10.1	Cracked	820	60	90	10.1	Cracked	1060	50	97	2.0	Cracked
N-46	Silene EF	30	55	1430	360	70	72	440	80	75	6.0	None	470	100	72	7.4	None	570	70	80	—2.8	Cracked
							168	570	60	84	7.4	Cracked	670	60	85	9.8	Cracked	770	60	88	0	Cracked
N-47	Cab-O-Sil	25	55	1710	380	66	72	630	100	79	5.7	None	710	120	73	6.4	None	870	110	80	—3.6	None
							168	670	40	89	15.1	Cracked	670	50	87	14.7	Cracked	1680	30	100	10.4	Cracked
N-84	Valron Estersil	40	20	1810	550	73	72	400	190	67	14.0	None	600	240	64	13.3	None	820	210	78	3.4	None
							168	120	80	63	25.5	Cracked	220	100	62	30.6	None	570	50	90	23.7	Cracked
N-85	Calcene NC	70	20	1090	440	60	72	420	120	66	8.1	None	310	140	64	11.4	None	370	120	68	1.3	None
							168	350	100	73	8.9	None	270	70	76	14.4	None	230	60	78	6.1	Cracked
N-86	Hi-Sil C	45	20	1800	480	80	72	670	120	87	4.4	None	810	150	86	5.1	None	610	110	92	—3.9	None
							168	670	80	91	5.0	None	850	20	97	15.3	Cracked	810	70	93	—0.2	Cracked
N-87	Cab-O-Sil	40	20	2370	540	77	72	890	150	83	9.6	None	1070	200	80	10.1	None	1170	180	83	1.4	None
							168	310	50	84	19.6	Cracked	850	20	92	18.7	Cracked	770	70	89	19.0	Cracked
N-88	Silene EF	55	20	1230	450	71	72	440	100	73	3.2	None	530	120	74	3.2	None	630	100	80	—4.9	None
							168	390	70	82	3.7	Cracked	390	90	77	4.0	None	600	60	86	—4.0	Cracked

TABLE VII—THE EFFECTS OF VARYING THE ACCELERATOR AND ACTIVATOR ON THE AGING OF NEOPRENE WRT COMPOUNDS

Base recipe

Ingredients	Parts by Weight
Neoprene WRT	100
Magnesia	As shown
Filler	As shown
Butyl oleate	15
Zinc oxide	As shown
NA-22	As shown

Cure: 30 minutes at 310°F.

					Original Physical Properties				Physical Properties After Aging in Hydraulic Fluids at 400°F.														
										OS-45					85/15-MLO-8200/Monoplex DOS					MLO-8200				
Recipe	Filler	Filler phr	ZnO phr	MgO phr	NA-22 phr	Tensile Strength psi	Elongation %	Hardness Shore A	Aging Time hours	Tensile Strength, psi	Elongation, %	Hardness, Shore A	Swell, %	Cracking	Tensile Strength, psi	Elongation, %	Hardness, Shore A	Swell, %	Cracking	Tensile Strength, psi	Elongation, %	Hardness, Shore A	Swell, %	Cracking
N-91	Valron Estersil	40	5	6	1.0	1790	610	72	72	570	180	79	18.5	None	690	160	86	29.0	None	1510	30	98	16.7	Cracked
									168	650	100	85	26.6	None	530	40	85	43.6	Cracked	Cap blew off tube			
N-92	Calcene NC	70	5	6	1.0	1360	600	59	72	450	150	65	7.1	None	500	120	72	15.9	None	910	130	77	3.6	None
									168	780	80	83	7.5	Cracked	740	60	86	24.6	Cracked	1690	30	98	12.8	Cracked
N-93	Hi Sil-C	45	5	6	1.0	1810	610	78	72	600	140	85	5.0	None	450	110	82	9.2	None	610	100	92	—1.3	None
									168	180	60	76	29.4	Cracked	Cap blew off tube					1470	0	100+	—7.3	Cracked
N-94	Cab-O-Sil	40	5	6	1.0	2310	610	76	72	710	150	84	10.1	None	610	140	85	10.5	None	1010	120	90	2.8	None
									168	80	50	75	41.2	Cracked	390	60	81	37.0	Cracked	Cap blew off tube				
N-95	Silene EF	55	5	6	1.0	990	510	70	72	400	110	70	3.6	None	420	120	69	7.1	None	570	100	78	—2.4	None
									168	380	100	71	2.2	None	370	100	73	5.9	None	430	80	81	—0.9	None
N-96	Silene EF	60	1	4	1.0	1080	500	73	73	580	140	70	6.2	None	700	140	76	—0.7	None	750	140	76	—1.5	None
									168	570	60	81	4.9	Cracked	450	70	76	7.7	None	690	60	85	—1.4	Cracked
N-97	Silene EF	60	1	4	0.6	1170	520	69	72	550	110	71	5.1	None	730	130	79	—1.3	None	760	140	80	—1.6	None
									168	600	60	83	5.3	Cracked	590	70	83	5.3	Cracked	870	50	90	—2.5	Cracked
N-98	Silene EF	60	2.5	4	0.6	1170	480	74	72	530	130	69	7.7	None	740	160	75	—0.8	None	760	160	76	—1.3	None
									168	580	100	75	6.2	None	640	80	81	13.0	Cracked	610	80	82	1.0	Cracked
N-99	Cab-O-Sil	40	1	4	1.0	2730	580	73	72	730	150	78	11.2	None	1080	210	81	1.4	None	1100	220	82	1.4	None
									168	510	40	84	17.4	Cracked	1050	40	95	13.8	Cracked	Cap blew off tube				
N-100	Cab-O-Sil	40	1	4	0.6	2780	620	66	72	650	120	85	12.9	None	920	190	82	11.7	None	1040	200	84	1.3	None
									168	350	60	80	16.5	Cracked	540	70	78	20.3	Cracked					
N-101	Cab-O-Sil	40	2.5	4	0.6	3010	700	68	72	910	250	75	10.8	None	950	280	75	12.8	None	1520	320	80	3.0	None
									168	790	140	87	11.2	None	630	170	69	28.1	None					

made of the approximate time required for this composition to decline in elongation to the 100 per cent level listed as a minimum target property. By extrapolating the results for aging in the fluid blend for the 72- and 168-hour periods, it is estimated that the elongation would be reduced to 100 per cent after about 230 to 280 hours, at which time the tensile strength probably would be in the range of 400 to 500 psi. This is a considerable improvement over the starting recipes (N-2, N-3, and N-4), which would maintain the desired elongation for approximately 100 hours or less. While many compositions maintained the desired 800 psi tensile strength after aging 168 hours, the compounding adjustments needed to improve elongation and crack resistance reduced this time to about 100 hours. However, in evaluating the balance of properties for this application, it is considered more important to avoid hardening and loss in elongation than to maintain a high tensile strength.

Brittle Points of Neoprene Compounds

Table VIII shows the brittle points for representative Neoprene WRT compositions before aging. Fifteen parts of butyl oleate reduce the brittle point to near —60°F. Thus, a small amount of additional plasticizer is needed to reduce the brittle point to the required —65°F. Brittle points were not determined on oil-aged specimens, but it is speculated that samples which maintained the highest elongation and swelled the most should best survive this test.

Summary

This compounding study resulted in improved Neoprene WRT compounds for use in contact with silicate-ester type hydraulic fluids at high temperatures. The work showed that rubberlike properties can be maintained for at least 168 hours at 400°F. by judicious choice of fillers and curatives. The most successful compositions were either partially or totally reinforced with nonblack fillers, plasticized with butyl oleate, and cured with a combination of magnesia, zinc oxide, and NA-22. While such compounds usually had lower tensile strengths than the more conventional, black-filled compositions, they were superior in their ability to retain rubberlike properties after aging.

Aging tests longer than 168 hours were not carried out with Neoprene WRT, but it is doubtful that good properties would have been maintained for the required 500 hours. Further studies along the lines already followed should produce compounds that approach the 500-hour goal.

TABLE VIII—BRITTLE POINTS OF SEVERAL NEOPRENE COMPOUNDS

Cure: 30 minutes at 310°F.

	Compound N-3	Compound N-11	Compound N-15	Compound N-29	Compound N-34
Brittle Point, F	—60	—60	—58	—56	—60
Ingredients, parts by weight					
Neoprene WRT	100	100	100	100	100
Magnesia ELC	4	4	4	4	4
Continex SRF	40	—	—	—	15
Thermatomic P-33	—	—	110	—	—
Thermax	40	—	—	—	15
Calcene NC	—	60	—	—	—
Hi-Sil C	—	—	—	50	—
Butyl oleate	15	15	15	15	15
Zinc oxide	2.5	2.5	2.5	2.5	80
NA-22	1.0	1.0	1.0	1.5	1.0

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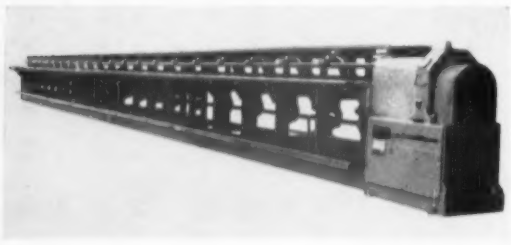
(1) Bradbury, E. J., and R. A. Clark, "Aluminum Block Heater for Aging Rubber at High Temperatures," *Rubber World*, Vol. 134, pp. 872-876 (1956).

(2) Kitts, F. G., WADC Technical Report 54-458, dated December, 1954.

(3) Mueller, W. J., and R. A. Clark, "Compounding Acrylate Polymers for Resistance to a Diester Lubricant," *Ind. Eng. Chem.*, Vol. 48, p. 982 (1956).

Iddon Hose Wrapping-Building Machines

A new line of semi-automatic, air-operated hose wrapping and building machines was recently introduced by Iddon Brothers of Leyland, England. The new machines



are said to incorporate features which are most desirable for operation. Basically, the drive and gear unit are used for various lengths of machines (see illustration), the largest being 62 feet. Various lengths can be made to suit specific requirements. The machine will take mandrels from ⅜-inch to four inches in diameter, and the gear unit will give roll speeds in both directions of 60, 120, 180 and 240 rpm. The three main rollers are 2¼ inches in diameter. They are carefully jointed and are carried in anti-friction bearings. Roll centers are variable to suit different mandrel diameters by large cams controlled by a central worm and worm wheel. The top pressure roller is air operated and controlled by means of a foot treadle which was the full length of the machine, giving the following sequence of operation: (1) Depression of foot treadle causes the top roll to lower and on contact with the material the rolls begin to revolve; (2) A second depression of the foot treadle stops the machine and causes the top roll to rise. All equipment produced by Iddon Brothers is available in the United States and Canada from the Wilmod Company Rubber Division 2488 Dufferin St., Toronto, Ontario, Canada.

Cause and Cure

Additional reports of avoidable accidents

FROM time to time reports of avoidable accidents which occur in rubber manufacturing plants in this country and abroad appear in the *Safety News Letter*, published by the Rubber Section of the National Safety Council. The following accidents occurred at a tire plant. The corrective measures were recommended and carried out by the plant's special accident investigating committee, headed by the assistant factory manager and including the plant engineer and the production and materials division managers.

CAUSE: A calender wind-up man was sliding a 30-inch liner off the top of a loaded truck when he pulled off an empty 30 by 6-inch plastic shell with it. The empty 6-pound shell fell endwise to the floor, fracturing the base of his right big toe.

CURE: After this accident, a rule was made that all transportation of empty shells and liners must be done on separate trucks. Mixed loads are now forbidden.

CAUSE: A fork truck operator suffered severe cuts and bruises when his truck fell part way into the opening between boxcar and dock. While backing out with a load of rubber, the small rear wheels struck the car end of the heavy steel bridge-type dock plate, bending the retainer pins and kicking it back so that the plate and truck tipped into the opening and threw the operator backwards onto the loading platform.

CURE: A 4-inch angle iron, drilled with a series of holes, was fastened to the face of the loading dock, 8 inches below and parallel to the edge. Hardened steel pins are now passed through both top and bottom holes at the edge of the dock plate and through the angle iron described above.

CAUSE: A tuber mill operator climbed on top of a skid loaf of slab rubber to work on a jammed overhead belt feed conveyor. While pulling on the underside of the belt, his feet slipped and he fell three feet to the floor, fracturing his left kneecap and left wrist.

CURE: Since the accident a rolling platform scaffold with a handrail on three sides has been provided to help enforce the "no climbing" rule. This area has a network of overhead mill-to-mill feed conveyors.

CAUSE: A first-ply operator on a conveyor tire building unit lost the end of his left index finger when his attention was distracted while applying gumbo. The building drum sections snapped to the expanded position just as he got his finger too close to the "bite." Normally the drum is expanded by the take-off man as he walks away from the machine.

CURE: Eventually these old type drums will be expanded pneumatically between operations. However, in the meantime, since this pinch point cannot be guarded, the job specifications and requirements are being enforced to make sure that the building drum is completely expanded, to present a smooth surface for the application of gumbo to make the first ply of the next tire adhere to the bare drum.

CAUSE: A near-fatality occurred to a serviceman in a customer's garage when a locking ring flew off a 1100-20 tire assembly and struck the employee in the forehead, severely fracturing his skull. Again the uncontrolled human element had taken its toll because there were two heavy retainer chains lying rusting and forgotten on the mounting stand.

CURE: In this case, the supervision was sternly called to account, and strict enforcement stated on the use of the safety chains both for the preliminary airing of the tire to seat the lock ring on the rim and for the final inflation to 70 pounds pressure.

CAUSE: A fork-lift tractor operator backed down a ramp from a loading platform and then turned the tractor and, not noticing the location of a trailer, backed the tractor underneath the bed of the trailer. He received injuries to the chest and back. Another factor in the accident may have been the fact that the hydraulic line was leaking and might have caused the employee's foot to slip off the break pedal.

CURE: Orders were issued that operators of tractors were to face the direction in which they were traveling. All equipment was given a safety check to insure proper operation.

CAUSE: An employee was milling rubber in a test laboratory when his hand was caught in the bite of the rolls as he attempted to force the rubber sample into the mill. He stopped the mill with his left hand after the four fingers of his right hand were caught.

CURE: A knee safety, which was in the process of being installed at the time of the accident, was put in.

How to Apply

X-RAY ANALYSIS

By Vern W. Palen
Instruments Division, North American Philips Co., Inc., Mount Vernon, New York

IN the rubber industry, X-ray diffraction instruments are useful tools for solving a number of difficult research and production problems. A special advantage is that specimens which are analyzed by X-rays are unharmed and remain available for other tests. The X-ray diffractometer is the instrument better suited for certain tasks, while for others the X-ray spectograph is called upon to give the answers.

One company recently used the diffractometer to study the differences in uniformity of synthetic rubbers. In one instance, 14 specimens, of which six were Type A, two were Type B, three were Type C and three were Type D, were studied. No special techniques were required in preparing the specimens for X-ray analysis, as samples were merely cut to fit into the standard Norelco holder and inserted one at a time. A copper target X-ray tube provided the radiation, and charts were recorded in the two-theta range from 3 to 70 degrees.

The six Type A specimens were from batches of a copolymer of butadiene and styrene in a ratio which gave 23.5 per cent bound styrene. These rubber specimens were polymerized at approximately 121°F., activated with potassium persulfate, emulsified with sodium fatty acid soap, short-stopped with sodium sulfide, and stabilized with 1.25 per cent triphenyl phosphite.

The two Type B specimens were from batches of cold rubber, a mix of a copolymer of butadiene and styrene in a ratio which gave a 20 per cent bound styrene. These rubber specimens were polymerized at 41°F., activated with diisopropyl benzene hydroperoxide, emulsified with sodium rosin soap, short-stopped with dinitrochlorobenzene, and stabilized with phenyl beta napthylamine.

The three Type C specimens were the same as Type B except that they were short-stopped with a mixture of sodium dimethyl dithiocarbamate and sodium polysulfide. The three Type D specimens were from a mix of 100 parts of Type B with 25 parts of petroleum derivative used as a softener oil to improve resilience.

Figures 1, 2, 3 and 4 show X-ray diffractometer charts made from specimens of the four types named. All the charts show a broad intensity at roughly 20 degrees (two theta), with two other broad lines centering at about 10 degrees and 30 degrees, respectively. These three lines have widths at half-intensity of about eight degrees. The weaker two that centered at about 10 and 30 degrees, which appear as low rises, were probably due

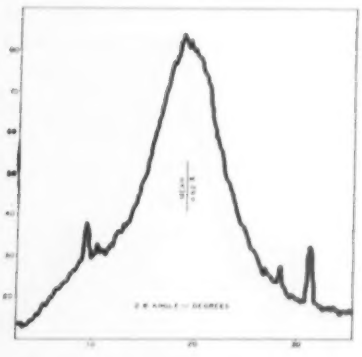


FIG. 1—X-ray diffractometer chart of butadiene-styrene rubbers made to show differences in uniformity of specimens.

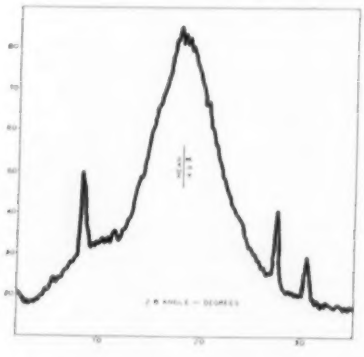


FIG. 2—X-ray diffractometer chart of cold butadiene-styrene rubbers, also made to study differences in uniformity.

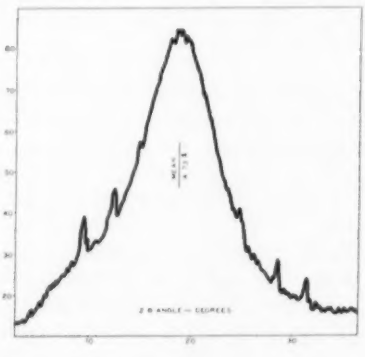


FIG. 3—X-ray diffractometer chart of rubbers like those of Figure 2, but which were short-stopped with other materials.

TECHNIQUES to Rubber Problems

to the structure of the actual rubber molecules. It will be noted that the mean spacing of the most intense line is 4.62 Angstroms for the Type A specimen charted. It is 4.9 for Type B, 4.73 for Type C, and 4.56 for Type D. Of equal importance to the analyst are differences in the over-all contour of the peaks. Such comparisons roughly illustrate how the X-ray method distinguishes one specimen type from another.

Amount of Sulfur in Rubbers

Another company had a problem that involved the quantitative determination of combined sulfur in both natural and butyl rubber specimens. Five natural rubber specimens (E, F, G, H and I) taken from tread stock had different curing histories: 15, 30, 45, 60 and 120 minutes, respectively. Six butyl rubber specimens (J, K, L, M, N and O) taken from tube stock and cured 1, 3, 4, 6, 8 and 12 minutes respectively were also analyzed. Rock salt was used as an analyzing crystal and radiation was supplied by a tungsten target tube. All specimens were suspended in warm acetone for about two hours to wash away the free surface sulfur. Specimens were then placed

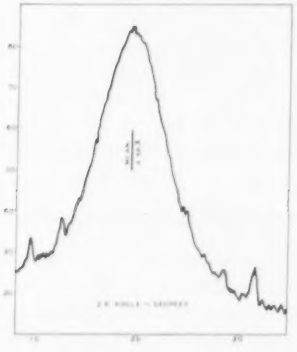


FIG. 4—X-ray diffractometer chart of rubbers with a petroleum derivative used as a softener.

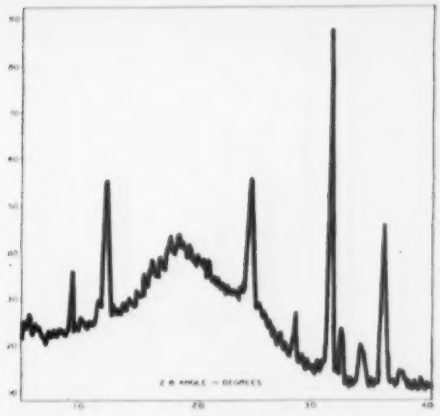


FIG. 5—X-ray diffractometer chart of natural rubber taken from tread stock with a cure time of 15 minutes, made to find the sulfur content.

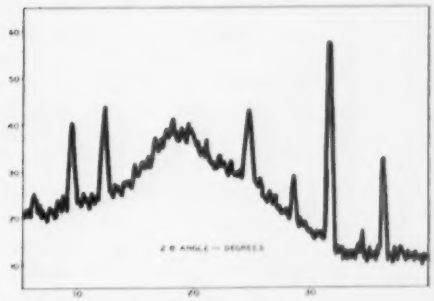


FIG. 6—X-ray diffractometer chart of natural rubber like that of Figure 5, but with a curing history of 120 minutes instead of 15 minutes.

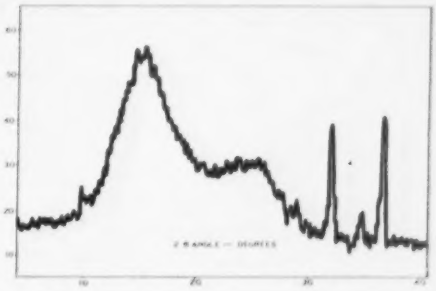


FIG. 7—X-ray diffractometer chart of butyl rubber taken from tube stock with a cure time of one minute, made to find the sulfur content.

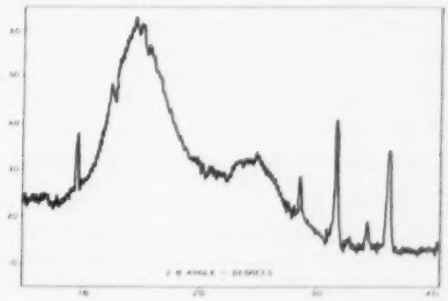


FIG. 8—X-ray diffractometer chart of butyl rubber like that of Figure 7, but with a curing history of twelve minutes instead of one minute.

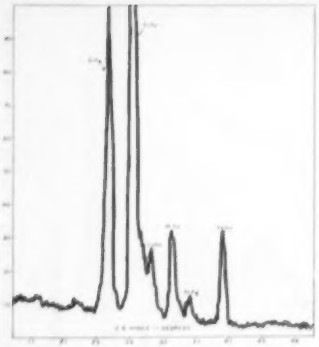


FIG. 9—X-ray spectrograph chart of a specimen of sponge rubber made to detect the presence of metals.

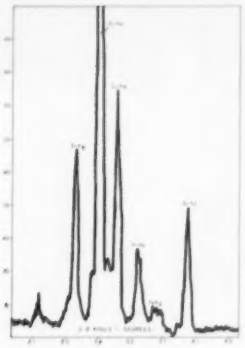


FIG. 10—X-ray spectrograph chart of fabric made to detect certain metals.

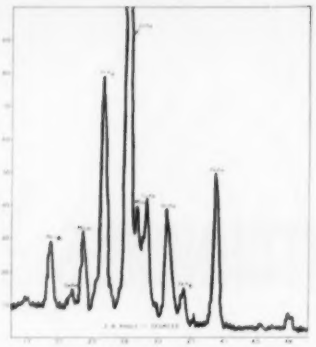


FIG. 11—X-ray spectrograph chart of a specimen of plastic made to show the presence of certain metals.

in the holder of the Norelco spectograph and sulfur intensities were measured by the fixed count method. Specimen E registered 43.1 net counts per second, specimen I registered 55.2, specimen J registered 21.4 and specimen O registered 30.5 counts per second. This indicates that the sulfur content is increased by the curing process. These same specimens were also analyzed in the X-ray diffractometer and Figures 5, 6, 7 and 8 show the charts, which clearly indicate differences in atomic structure.

Detection of Metals

A third manufacturer used the X-ray spectograph for the detection of certain metals in sponge rubber, fabric and plastic products. In this work, charts were run on each specimen through the spectrum from 125 degrees down to 2 degrees (two theta). Rock salt was employed as an analyzing crystal and radiation was supplied by a tube having a tungsten target. Figures 9, 10 and 11 show the results for the three types of materials. The presence of copper, zinc, nickel and iron is clearly indicated. The manufacturer wished only to establish whether the materials were present. If quantitative measurements were desired, suitable standards would be needed. Then, by comparing peak heights of unknowns with standards, the amounts of each metal could be readily ascertained.

As will be noted from Figure 11, the plastic specimen contained lead and selenium in addition to the four other metals named above. The fabric specimen contained a small amount of manganese. This does not show on the chart, seen in Figure 10, since it was only a trace. However, determination of such small quantities is readily accomplished on the same X-ray spectrograph by using the direct count method.

Still another manufacturer desired to distinguish different types of graphite, including raw cokes and electrode material. The X-ray diffractometer was used for the analysis, and radiation was supplied by a tube with a copper target. Specimens were sieved through a 400-mesh screen and were dry-packed into the instrument mount, in order to provide a flat uniform surface for the X-ray beam. Charts were run through a spectrum range from 95 degrees down to 2 degrees. By comparing angles and intensities on the charts, specimens were graded for degree of graphitization and other character differences. Figure 12, which is a typical chart for graphite, was made using a raw coke specimen.

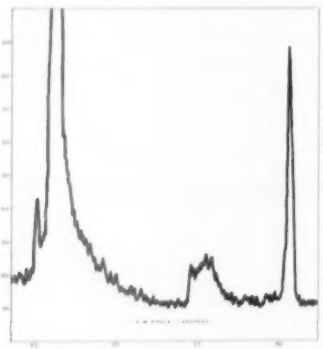


FIG. 12—X-ray diffractometer chart of a raw coke specimen which was made to distinguish different type graphites.

The three examples discussed here give some idea of the wide range of research and production problems relative to the rubber industry for which X-ray analysis techniques have an application. The X-ray instruments offer the rubber scientist increased facility in answering the questions which confront him daily in his laboratory.

An **automatic scale** announced by the Richardson Scale Co., Clifton, N. J., was designed for use in the plastic and similar industries for weighing such products as polyethylene and plastic materials. The scale features special electrical components for operation under hazardous gas and vapor conditions.

A **bulk weigher** from Toledo Scale Co., Toledo 1, Ohio, prints and totals weight records of bulk materials away from the machine. By printing the weight of the draft before discharge, and again after discharge, the weight of any material left in the hopper is automatically subtracted.

PROCEDURE IN OBTAINING PATENTS Part 1

By Kenneth W. Brown

Assisted by Arthur S. Collins and Curt B. Beck

Godfrey L. Cabot, Inc., Boston, Mass.

Is the inventor's "brainchild" patentable?
When should he submit his application?
How is it to be prepared?
Of what value is a patent?

The answers are given in a series of four articles beginning this month

The Patent Process

INVENTION is glamorous, springing mysteriously from the magical function of the human brain. Yet an inventor need not be a magician. He can produce a "brainchild" by applying himself to the solution of a problem. Invention lies in all technological advances, is the logical outcome of the work of research scientists, and may result from any type of work. And the award of a patent goes with its accomplishment.

Invention is the logical outcome of the work of research scientists.

Generally speaking, any new way of doing something, any new segment or arrangement of parts of an apparatus, any new manufactured article or composition of matter, when devised by human thought, is invention. It is *patentable* invention when it has utility, has not been described or used by others at some earlier time and is not something which anyone having ordinary skill in the same field of activity, or "art," might have thought of had he been faced with the same problem. It is, of course, patentable invention with which we are concerned and which is the most difficult to recognize.

No satisfactory formula has ever been devised by which a given discovery can unequivocally be designated patentable or unpatentable. Patentability is determined only by issuance, so until a patent is granted, one can only apply constantly changing tests which have evolved over the years. Such tests are adequate and will serve as our guides.

Invention, by which hereinafter is meant *patentable* invention, is present when a discovery is new, unobvious and useful. Thus, the first step in detecting the presence of invention is to ask yourself: "Is what I have done different from anything I know has been done before?" This question should be asked frequently and regularly until the habit of scrutinizing all of your activities for novelty becomes ingrained. Thereafter, recognition of invention will be automatic. You will be surprised at how often invention will appear.

Invention must then be examined for utility. It is sufficient that any possible practicable use may exist in theory or fact to satisfy the test of utility. When you have concluded, on the basis of your accumulated knowledge and from consulting appropriate reference books, that your discovery is new and useful, a patent disclosure should be made. Do not let the urging of natural modesty persuade you that the invention is one that anyone

skilled in the art might have made unless that is obviously so. Since the courts, the Patent Office examiners and the patent attorneys frequently disagree on the accomplishments of the mythical skilled artist, how can the potential inventor be expected to know when he has surpassed those accomplishments? If the results of a discovery are apparently new, useful and reproducible, they are established sufficiently to warrant disclosure for patent consideration.

Almost every civilized country of this world has a patent system of some sort. The object of such systems is substantially the same for each country. In the United States its purpose is to promote the progress of science and the useful arts. That our patent system has achieved this goal is abundantly clear.

Opponents of our patent system point with glee to those court decisions holding patents invalid. Yet, only a few dozen patents are invalidated each year out of about twice that many litigated, an insignificant number compared with the approximately 70,000 patents issued in the same period. It is thus a fair assumption that most patents issued are valid, and in fact it is a rule of law that a patent is presumed to be valid until proved otherwise.

One would be surprised to find many patents invalidated after the stringent handling their applications received in the Patent Office. Only rarely is an application allowed as first presented. The usual course of prosecution runs three to four years, and a longer period is far from exceptional. It is obvious that the issuance of a patent is a significant event and truly indicative of invention.

Kenneth W. Brown

KENNETH W. BROWN has acted as manager of the patent department of Godfrey L. Cabot, Inc., from 1948 to the present time. He received his A.B. degree from Harvard College in 1935, and his LL.B. degree from Harvard Law School three years later. From 1938 to 1942 and from 1945 to 1948 Mr. Brown engaged in the practice of general law, while the years in between were devoted to duties as a special agent for the Federal Bureau of Investigation. His organization memberships include the American Bar Association, American Patent Law Association, Boston Bar Association and the Boston Patent Law Association. The material presented in this series of articles is based on a course of ten printed lessons on patents distributed to the technical employees of Godfrey L. Cabot, Inc., and its subsidiaries.

Value of Patents Outlined

Why do we seek patents? There are few reasons not to, many for doing so. Consider the following advantages that patents give:

(1) Protect operations from interference by others who might otherwise patent the same features.

(2) Limit competion during the developmental stage of new procedures.

(3) Promote stability of industry by circumscribing the activities of imitators with shoddy goods.

(4) Earn important revenue from licenses.

(5) Enable their owners to obtain a position in a new field, i.e., to expand activities beyond their existing scope.

(6) Provide opportunities to establish business enterprises in foreign countries and to ensure the recoverability of income therefrom.

(7) Have great sales value by demonstrating to customers the technical competence of a company's employees and by protecting the customer from the danger of infringience patents which might else be owned by others in the same field.

What can a patent do? For one thing it can exclude others from carrying on activities defined by its claims for 17 years from date of issue. A patent can inform him who seeks often extensive, often valuable knowledge. Research can be stimulated in order that better products may be obtained. And the inventor gains fame; the owner, perhaps a fortune. An inventor-owner, then, may gain both fortune and fame.

To obtain a patent there must be invention. As has been stated, a patentable invention is any unobvious new and useful process, machine, article of manufacture or composition of matter. The questions of novelty and utility should present no particular problem to the inventor. He can usually decide for himself whether or not his discovery is useful and is new in the light of his knowledge of the state of the art. It can be left for the patent examiner and the patent attorney to determine whether the invention is new enough and sufficiently beyond the capabilities of the mythical man skilled in the art to be patentable.

To launch an invention on its course through the Patent Office, it is sufficient that the invention appear to be a useful departure from the prior art. If the departure is sufficiently extensive and is not obvious to a person having ordinary skill in that art, a patent will ultimately issue. There is no standard measure of required degree of departure, it being a matter of opinion in every instance. So it is usually preferable to resolve any doubt as to whether or not to file the invention in favor of filing an application.

What Constitutes Invention?

Invention is not for the unenterprising. It requires mental effort, yet no extraordinary mental equipment. Anyone who seeks to improve a process, machine, article of manufacture or composition of matter will almost always find invention where he finds the sought-for improvement.

An interesting feature of invention is its resistance to definition for universal application. Because the standards of invention are constantly changing with the

increasing sophistication of technology, the definition of the word itself is of little assistance in culling the patentable from the unpatentable invention. There is substantially universal agreement in the statement that invention is the contrivance of what has not existed before, the intellectual creation of something new and useful, the display of ingenuity beyond the compass of the routine thinker. The uncertainty arises when we must decide whether the new is new enough to be patentable and is beyond the skill of the routineer. Thus the measure of patentable invention is in the last analysis that of human opinion influenced and guided by past occurrences. Since the past is filled with conflicting opinion, one pays his money and takes his choice. The result depends upon how exacting are one's requirements.

When comparing court decisions in patent cases, the results are hardly consistent although they usually can be legalistically reconciled from full knowledge of all the facts. However, they do illustrate the statement made above that the existence or non-existence of patentable invention in any given case is largely a matter of circumscribed opinion. Hence a resourceful inventor aided by a resourceful patent attorney should be able to obtain and sustain a patent on almost any new and useful discovery.

The preparation and prosecution of patent applications, known to the trade as patent soliciting, is primarily a problem in advocacy based on facts created by the inventor. The objective of the patent solicitor is to convince the Patent Office examiner that patentable invention exists. The objective of the examiner is to prevent the sanctioning of patent claims for unpatentable inventions. The contest is never cut and dried. Since the invention is new to both inventor and attorney, the examiner rarely finds prior art (previously published patents, articles, etc.) directly in point. He thus must depend on finding an art as close as possible to the invention and argue that the claimed invention is no more than what any well-informed artisan would have come up with when faced with the same problem.

Beginning the Patenting Process

What happens to an invention from the time of its inception to the time of its patenting is briefly as follows. It starts its travels as a written description, technically referred to as a record of invention, or patent disclosure, sent to the patent attorney. The disclosure should contain a complete description of the invention and include experimental or operational data, if available. Records of work done leading to the invention, of course, should have been kept but need not be included with the disclosure. As the subject of invention records and disclosures is extensive and important, it will be discussed in detail below.

The patent attorney evaluates the disclosed invention for patentability and, if it appears to exist, prepares a patent application composed of a specification (complete description) and claims. Since only what is contained in the specification can be claimed, it is essential to include all conceivable alternatives and equivalents of the invention. Here the inventor and attorney must exercise their imaginations.

The claims define the invention. They are what measure the extent of patent protection. It is customary to claim as broadly as the invention permits to stake out maximum territory. Hence the claims are what the patent attorney and the Patent Office examiner argue about, the former to keep them broad, the latter to narrow them.

When the patent application reaches the Patent Office, it is classified according to its subject matter and is

It is seldom indeed that similar subject matter cannot be found.

routed to the one of the 73 examining divisions having jurisdiction over that subject matter. The chief of the division then assigns the application to an examiner having specialized knowledge in the particular segment of such subject matter to which the invention is specifically directed.

After some six to twelve months the examiner will finally get to the application. He skims the specification and studies the claims to determine his field of search, combing the indexes for patents and other publications relating to the subject matter of the invention *as claimed*. It is seldom indeed that similar subject matter cannot be found and more often than not it is uncomfortably close to the invention. The examiner then writes an "office action" listing the pertinent publications (referred to as references) and pointing out why in his opinion the claims do not define invention in the light of such references. Most claims are rejected in the first action.

The next move is up to the patent attorney who has six months in which to amend the application and argue patentability. Another office action follows, then a further amendment, and so on until the examiner either allows or finally rejects the claims. After final rejection the application may either be abandoned or appealed, first to the Patent Office Board of Appeals, and from there, if necessary, to the Federal court system.

Such, in brief, is the course of patent prosecution which will be discussed in greater detail in connection with actual patent applications. There are, of course, numerous intermediate steps not mentioned above which may be taken to ease the difficulties of driving an application through the Patent Office in the face of stubborn

resistance. These will also be described as the drama of patent pursuit unfolds.

The Importance of Invention Records

Industrial competition is so keen that substantially the same or closely related discoveries are often made independently by two or more individuals at about the same time. In such cases the care and accuracy in keeping records relative to the development of the respective inventions makes the difference between winning and losing patent rights. The legal establishment of the first inventor and one entitled to the patent depends upon certain significant dates, so the timing of the various steps taken in the creation and development of the invention is all-important. Therefore, it is highly desirable to make an authentic and complete history of every patentable idea and subsequent exploration, and to preserve it for possible future use.

The reduction to practice should be witnessed, recorded and dated.

We will have to admit that such perfection is not always possible for several reasons. First, the making of inventions is generally incidental to other major objectives in our day-to-day activities. Secondly, inventions often are not recognized as such until they have finally matured from some idea originally treated lightly and not, therefore, diligently pursued and described in detail.

Let us look at some of the many instances where invention records prove valuable and identify the most important for establishing priority of inventorship. Every invention, like a person, is marked by time in the course of its life. It is usually impossible to predict which significant date will become important. Furthermore, the benefit accruing from one date may well depend upon the establishment of a subsequent date. But no date is any better than its proof and there is no better proof than dated and witnessed writing.

The important dates are as follows: (1) first idea of the invention, (2) first written description and drawing, if any, (3) first disclosure to another not a co-inventor, (4) first performance, i.e., reduction to practice, and (5) filing of a patent application.

When a patent application is filed, the date of its filing is automatically put on record in the Patent Office. This date will be legally accepted as a date of invention for what the application shows. Even if the invention was never tested experimentally nor actually reduced to practice, the filing of the application is legally regarded as a constructive reduction to practice. Because of the definiteness of this date, there is obvious merit in early filing. Therefore, once the operable and probably patentable scope of the invention has been determined with reasonable certainty, the application should be prepared and filed as soon as possible.

However, if an invention has actually been carried out, that is, successfully reduced to practice—or diligent attempts made to reduce to practice—before filing of the application, authenticated records can be valuable in enabling an inventor to compete for award of priority of invention with applications bearing earlier filing dates than his own. With proper records the provable date of invention can often be carried back far beyond the filing date.

The final step in the making of an invention, namely its reduction to practice, is the event most often decisive in determining priority. Hence, it is this act which we should take the most pains to have witnessed, recorded and dated. As requirements for actual reduction to practice are usually quite high, it is preferable to carry out a successful test of the invention under practical conditions whenever possible. If a laboratory test is relied upon, actual operating conditions should be closely approximated. Under proper circumstances, however, other dates can be equally important, because an invention's priority date can be carried as far back of the date of successful reduction to practice as the efforts leading directly to that end were begun.

In this way one's date of invention can even revert to the earliest provable date it was conceived, which is in reality the date of the inventor's first written or oral disclosure to someone able to serve as a reliable witness. A corroborating witness is necessary because the testimony of an inventor or co-inventor concerning his own invention is presumed to be biased and hence of no value. Therefore, some care is necessary in selecting witnesses to avoid using someone who may prove to be an inventor or co-inventor when the entire picture has crystallized.

Probably the severest test imposed on the records of an invention is involving the patent application in an interference with another application or a patent claiming, in part at least, some of the same subject matter. An interference is a rather complicated proceeding by which the Patent Office determines priority of inventors. The winner of this proceeding will be determined on the basis of the records which can be placed in evidence and corroborated by testimony of witnesses. On the average about 5% of all applications—some 3000 to 4000 yearly—becomes involved in interferences and many of these contests are settled by agreement between the parties. However, even in negotiating a settlement, the strength of the bargaining position of each participant will depend largely on the sufficiency and authenticity of his records.

The matter of records is also important in the event a patent becomes involved in litigation during its 17 years of life because, even after allowance, the validity of

a patent is subject to attack, particularly if pertinent prior art can be located which was not cited by the Patent Office. When a patent is litigated—though few are—the stakes are obviously very high and every avenue of attack is explored. This means that the inventor's records will then be subjected to every possible criticism. Also, the records behind a patented invention often enable the patentee to avoid court battles by convincing his prospective opponent that it would be foolhardy to question the patent's validity.

The most frequent need for invention records appears in the regular prosecution of an application in the Patent Office. This need involves the citation against an application filed prior to the applicant's filing date of a pertinent reference published within one year prior to that date. The pertinence of this reference presumably lies only in what it discloses, which means that if it is a patent it probably discloses but does not claim an important part of the invention claimed by applicant.

Any potential anticipatory effect of such a reference can be nullified if the applicant can prove to the examiner's satisfaction that the invention was completed prior to the effective date of the reference. An affidavit to this effect, supported by documentary proof of the earlier reduction to practice of that part of the invention disclosed by said reference, will satisfy the examiner's requirements, whereas an unsupported affidavit alone usually will not. An inventor who has performed, and kept records of, the experimental work prior to the filing of his application is often able to gain allowance of claims which would otherwise be ruled unpatentable. This procedure for avoiding a reference is known as "swearing behind a reference."

The following specific suggestions may help in improving the patent value of record-keeping procedures:

(1) Get in the habit of writing down a description of your ideas or schemes for making improvements or achieving new objectives as soon as they come to you, even if operability in all details is not completely clear. Even if these disclosures are incomplete as first recorded, reference to them later may aid your mind in fitting together the remaining pieces of the puzzle.

(2) Try to be as complete as possible, using sketches where helpful, and always date and sign everything.

(3) When a complete solution is believed to have been worked out, show the earliest understandable written description to someone—preferably two persons—not a co-inventor, and have him sign as a witness and note the date of earliest disclosure to him.

(4) The use of bound notebooks for recording both ideas and experimental work is desirable. If each page of such a book is used in order and accurately dated, a systematic chronological picture of the work is given which adds authenticity to the records. In using such books it is recommended that original data be entered directly and erasures avoided. Corrections should be made by striking out errors and initialing and dating all insertions. When the experimental work on an invention is performed and recorded by someone not a potential inventor or co-inventor, then that worker himself in signing his records qualifies himself as a witness for patent purposes. However, if the worker is an inventor, then he should be sure to show the notebook records at logical intervals to a non-inventor and have that person sign each page as witness.

(5) Describe experimental conditions and results completely, particularly those which may be relied on to distinguish patentability over the prior art. However, care should be used to avoid derogatory statements which might be construed as indicating total failure when results are actually encouraging but do not perhaps meet commercial standards.

Writing down ideas as they come improves the patent value of records.

(6) If experimental or practical reduction to practice is carried out, be sure to have the successful test witnessed by someone qualified to testify to the technical soundness of the observations.

(7) Put as much as possible into the record to indicate continuing work and diligence of effort to perfect invention from date of conception until date of actual reduction to practice.

(8) When an invention has been tested and proved successful, or, if experimental work on an invention cannot be arranged in the foreseeable future, prepare a Record of Invention Disclosure and Patent Proposal covering same and forward this to your Patent Counsel as soon as possible. A very simple form of disclosure is adequate for this purpose. The only data deemed essential, other than the actual description of the invention, are the earliest provable dates which the inventor's records can show for several of the most significant events in the development of his invention, the name, signature, and address of the inventor, and names and signatures of witnesses. These data, in other words, summarize the available evidence of inventorship and the priority dates therefor. It should be remembered, however, that the chief purpose of the written disclosure is to provide the information necessary for preparing a patent application and, therefore, the description of the invention should be as complete as possible.

Carbon Blacks in Nitrile Rubber Compounds

By Z. RIGBI

Rubber Research Association, Ltd., Ir Ganim, Kfar Ata P.O., Israel

Blends of MT, SRF and FEF Blacks are interesting for both technical and economic reasons

IN discussing the use of blends of carbon blacks, Humphreys* mentions the application of SRF and FT blacks in the design of nitrile rubber compounds. The SRF black stiffens the vulcanizates rapidly with increased loadings. The tensile strength is excessively lowered by FT, though the high elongation is retained. Blends are therefore recommended, but no details are given. The compounding of nitrile for high tensile strength at low durometer values is complicated by the fact that the medium blacks do not confer the tensile values required, and recourse must be made to HAF and MPC and blends plus substantial proportions of plasticisers.

The principal blacks most useful for medium hardness nitrile compounds (in the range of 60 to 70 degrees Shore A) appear to be FEF, SRF and MT, the latter because of its comparatively low price. In order to study the technical and economic aspects of blends of these blacks, the experiments described in this article were made. They are interesting because of the wide variations in elongation and modulus, with comparatively narrower changes in tensile strength.

*N. C. H. Humphreys, "Blends of Carbon Blacks, Technical and Economic Aspects," Symposium on Carbon Blacks, Sveriges Gummitekniska Förenings Publication No. 7, November 1954.

Compounding the Test Rubbers

The compounds were all based on a 60 part loading of black, the other ingredients being:

Nitrile rubber	100
Stearic acid	1.5
Zinc oxide	5
Tetramethyl thiuram monosulfide	0.6
Sulfur	1
Di-2-ethylhexylphthalate (D.O.P.)	10
Cumarone resin (70°MP)	10

The acceleration and curatives were selected to provide good resistance to permanent set and aging, but no antioxidant was included purposely because a measure of the properties of an aged compound was desired. Accordingly, all compounds were air-aged four days at 70°C. before testing, and the properties are therefore those that may be expected from a protected compound after an extended period of aging.

The blacks were milled into the rubber to provide 0, 15, 30, 45 or 60 parts of each black as required, with a total of 60 parts per 100 of rubber. Fifteen compounds, covering the full range, were prepared. Masterbatching techniques were used, and the relevant proportions of masterbatch were mixed under identical conditions to give the required compounds.

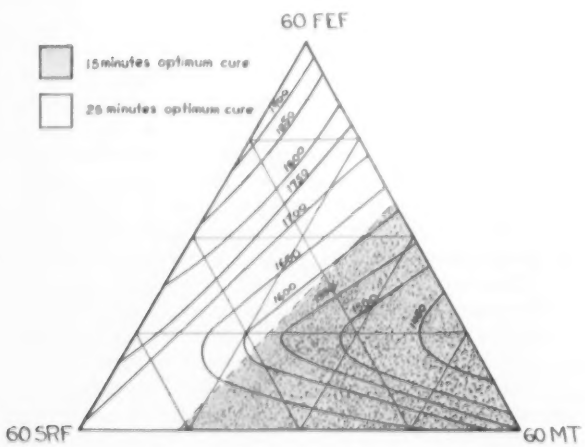


FIG. 1—Tensile strength (pounds per square inch).

FIG. 2—200 per cent modulus (pounds per square inch).

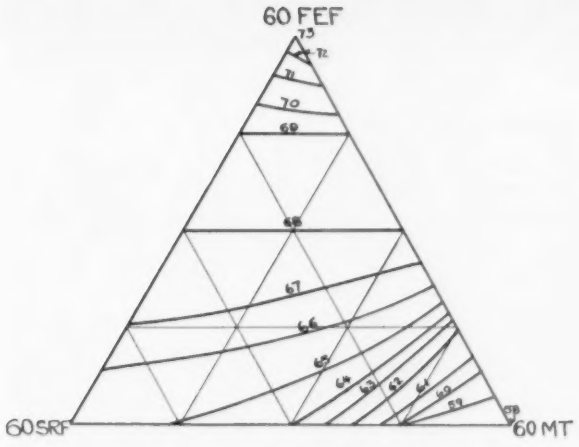


FIG. 3—30 seconds hardness (I.S.O. degrees).

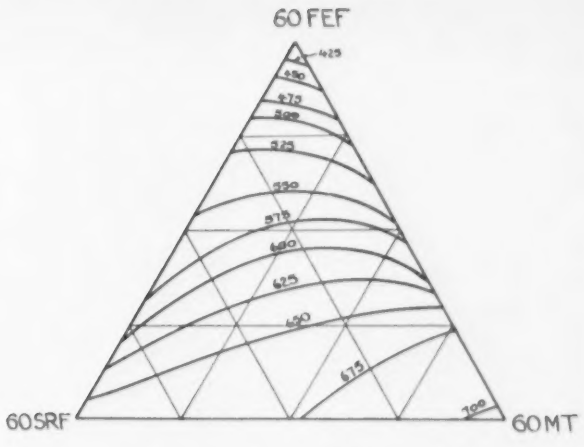


FIG. 4—Elongation at break (per cent).

The nitrile rubber used was Krynac 800 (Polymer Corporation), and the accelerator was Monex (Naugatuck). The MT black was Thermax (Vanderbilt); the SRF black, Continex SRF (Witco), and the FEF black, Sterling SO (Cabot). They are taken as typical of their grades. The compounds were cured 15, 25 and 40 minutes at 148°C. (298°F.) and aged as mentioned above, except for permanent set buttons which were cured only at the optimum as determined by tensile tests.

Testing the Rubber Compounds

The tensile tests were all carried out on a Scott ORR-L5 machine using B.S. 903 "C" dumbbells. The hardness was determined on four plied-up sheets using a Wallace Dead-Load Tester calibrated in I.S.O. degrees. Tear resistance was measured on the British Standard Crescent Test Piece on the Scott machine. Permanent set was determined according to ASTM Method B, 22 hours at 70°C., 30 per cent compression, and the swelling in ASTM Reference Oil No. 3 for seven days at 70°C.

The results are given in the triangular diagrams, which were plotted at optimum cure. The diagram for cost, which is Figure 6, was based on the ruling prices per 100 pounds of American manufacturers for the Israel market, as follows:

	F.O.B. U.S. Port	C.I.F. Israel Port
MT	$5.25	$6.25
SRF	6.35	7.835
FEF	7.35	9.105

These prices were obtained from one manufacturer of blacks and are assumed to apply to the actual blacks selected.

The curves on the triangular charts were drawn from smoothed out values of the various parameters along chosen axes. A different choice of axes would probably have resulted in curves of slightly different shapes but with the same relative position.

Results Obtained from the Tests

1. Optimum Cure. Reference to Figure 1 will show that optimum cure is about 15 minutes for a range of mixed blacks comprising a large proportion of MT. When larger proportions of SRF and particularly FEF

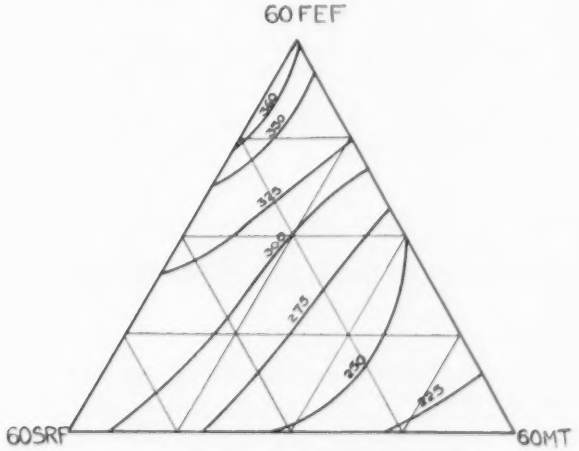


FIG. 5—Tear resistance (pounds per inch width).

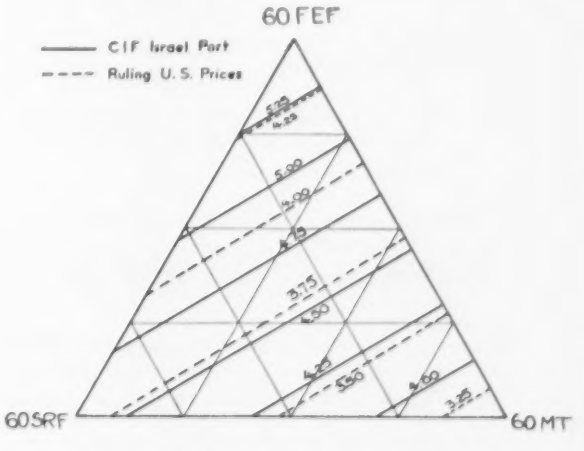


FIG. 6—Cost of black (dollars per 100 pounds of nitrile).

are employed, the time for optimum cure rises to 20 to 25 minutes, indicating absorption of the accelerator by the blacks.

2. Tensile Strength. The lowest tensile strength appears in a blend of 15 parts FEF and 45 parts MT black, which is about 100 psi lower than an all-MT compound. With increased proportions of FEF, the tensile strength rises again. Substituting SRF for MT, tensile increases rapidly at first and then slows down at about 15 parts SRF. When substituting FEF for SRF, the tensile rises quite uniformly.

3. Modulus and Hardness. In a loading containing principally MT black, the hardness contours run roughly parallel to the modulus contours; however, when the loading is principally FEF, the hardness contours slope in a direction opposite to the modulus contours. The increases in modulus when SRF or FEF is substituted for MT are uniform, and also when FEF is substituted for SRF. However, if 30 parts of FEF are substituted for SRF or MT, changes in hardness are slower than at either end of these axes.

4. Permanent Set. This was between 9 and 11 per cent in all cases, but there was no apparent correlation with the proportions of the blacks used.

5. Oil Absorption. There were only small differences of volume swell in the compounds containing the various blacks, and these differences could not be correlated with other variables.

6. Cost. Together with the price chart, the other diagrams show what price savings can be achieved by the use of blends for the maintenance of given mechanical levels.

Application of the Results

Problem 1. A compound contains 30 parts SRF and 30 parts MT, and has a tensile strength of about 1670 psi, and a hardness of about 64. In the SAE designation this would be referred to as SB 617. It is desired to increase the hardness to as near 70 as possible without increasing the cost.

Answer: This cannot be done, since the cost contour is parallel to the hardness contour in that region.

Problem 2. A diaphragm is made out of nitrile with 45 parts FEF and 15 parts MT black. A temporary shortage of MT occurs, and the use of SRF as a substitute is proposed. The substitution, however, must be made without changing the modulus or the s.g.

Answer: Use 30 parts FEF and 30 parts SRF. Tensile and elongation will rise, so will tear, and hardness will remain sensibly constant. The cost of black will rise about 5 cents per 100 pounds of nitrile.

ACKNOWLEDGEMENT

This note is published with the permission of the Board of the Rubber Research Association, Ltd., Ir Ganim, Israel. The author gratefully acknowledges the assistance of H. Berkley in determining the technological parameters.

Coming Next Month...

Compounding Rubber for Resistance to Silicate-Ester Type Hydraulic Fluids at 400°F. II—Nitrile, Vinyl Pyridine, Butyl and Acrylate Polymers—By W. J. Mueller and R. A. Clark, Rubber and Plastics Division, Battelle Memorial Institute, Columbus, Ohio.

The second part of a two-part article beginning in this issue. Part II continues the discussion on the efforts made to develop a rubber composition which would resist degradation when aged for periods up to 500 hours at 400°F. in silicate-ester hydraulic fluids.

Investigation of the Pandux Tester for Use in Determining the Comparative Compression Resistance Values of Latex Foam Rubber Materials—By S. A. Eller, Material Laboratory, New York Naval Shipyard, Brooklyn, N. Y.

Covering an investigation to determine the suitability of the Pandux tester for obtaining the compression resistance values of latex foam rubber materials. The relative merits of the tester for use in the factory and laboratory are discussed.

Procedure in Obtaining Patents—By Kenneth W. Brown, Arthur S. Collins and Curt B. Beck, Godfrey L. Cabot, Inc., Boston, Mass.

The second part of a four-part article which begins in this issue. Part II considers how to prepare the patent application.

Reinforcing Agents for Rubber—Carbon Black and Silicas

A report of a symposium held at the Spring Meeting of the Southern Ohio Rubber Group, including a complete transcript of the talks given by each of the participating panel members.

The panel of speakers who addressed the April meeting of the Fort Wayne Rubber and Plastics Group devoted the program to the properties of butyl rubber. Seen, from left to right, are the four panelists: Robert L. Zapp, Charles E. Waggner, Robert F. Neu and Clifford A. Coffey.

Symposium on Butyl Rubber

The Fort Wayne Rubber and Plastics Group featured a report on butyl rubber at its April 10 meeting

A SYMPOSIUM on butyl rubber was featured at the April 10 meeting of the Fort Wayne Rubber and Plastics Group at the Van Orman Hotel in Fort Wayne, Indiana. The panel was composed of four representatives from the Enjay Company. Clifford A. Coffey, of the Akron, Ohio office, gave an introduction in which he discussed the general nature of the butyl polymer. He was followed by the three speakers: Robert F. Neu (Enjay Laboratories, Clifton, N. J.), whose subject was "Ozone Resistance and Weatherability of Butyl Rubber Compounds;" Charles E. Waggner, of the Chicago office, who spoke on "Heat, Aging and Chemical Resistance of Enjay Butyl Rubber," and Robert L. Zapp (Enjay Laboratories, Clifton, N. J.), who reported on "The Dynamic Properties of Butyl Rubber." The talks made by the three speakers follow.

Ozone Resistance and Weatherability of Butyl Rubber Compounds

By Robert F. Neu

ENJAY Butyl Rubber by virtue of its low unsaturation compared to other general purpose elastomers is inherently resistant to ozone attack and weathering. This fact has made the polymer a natural choice for applications in which ozone resistance and weatherability are among the prime quality considerations. The automotive

TABLE I—FACTORS AFFECTING OZONE RESISTANCE OF BUTYL RUBBER COMPOUNDS

1. State of cure
2. Polymer grade—low unsaturation
3. Carbon black loading
4. Plasticizer content
5. Contamination
6. High sulfur

TABLE II—BASIC FORMULATION FOR OZONE RESISTANCE STUDY

Enjay Butyl Rubber 268	100.0
SRF Black	90.0
FEF Black	30.0
Zinc oxide	5.0
Faxam 40 (process oil)	10.0
TMTDS	1.5
MBTS	1.0
Sulfur	1.25
Sulfasan R	1.25

industry, in particular, is finding more and more outlets for Enjay Butyl Rubber in the many mechanical goods which require the above properties. Among the most important of these, of course, are the weatherstrips for the front and rear windows.

As is the case with most materials, however, this "inherent" property is not independent of certain compounding variables. The data presented here stem from a systematic study of compounding variables which do affect the ozone resistance of butyl vulcanizates. Although this study was aimed at producing a superior black weatherstrip, the principles and conclusions arrived at will apply to any butyl rubber compounding.

Factors Affecting Ozone Resistance

A summary of the factors affecting ozone resistance of butyl rubber compounds is shown in Table I. Certainly the most important of these is state of cure. In addition, the polymer grade (particularly with respect to unsaturation), the carbon black type and loading, the plasticizer content, contamination with other polymers, and sulfur content all affect the ultimate ozone resistance of the vulcanizate.

In this study these factors were each examined to determine their specific effects on ozone resistance and weatherability. The control compound used is shown in Table II. As mentioned previously, state of cure is by far the most important single factor in obtaining the maximum ozone resistance of Enjay Butyl Rubber compounds.

Cure studies, using modulus determinations or volume swell in cyclohexane, have shown that in a typical TMTD-MBT type acceleration system, optimum cure is reached in about 20 to 25 minutes at 320°F. The effect of cure time on ozone resistance is shown in Figure 1. Undercuring (5 to 10 minutes at 320°F.) leads to severe cracking in the 50 part per 100 million ozone chamber, while in the region of optimum cure state, 20 to 30 minutes at 320°F., excellent ozone resistance is obtained with the same compound.

Overcure also can reduce ozone resistance, although not as drastically as undercure. For example, volume swell data might indicate only a slight reversion on overcure, but any surface reversion on overcure, which would not show up significantly in the volume swell test, could

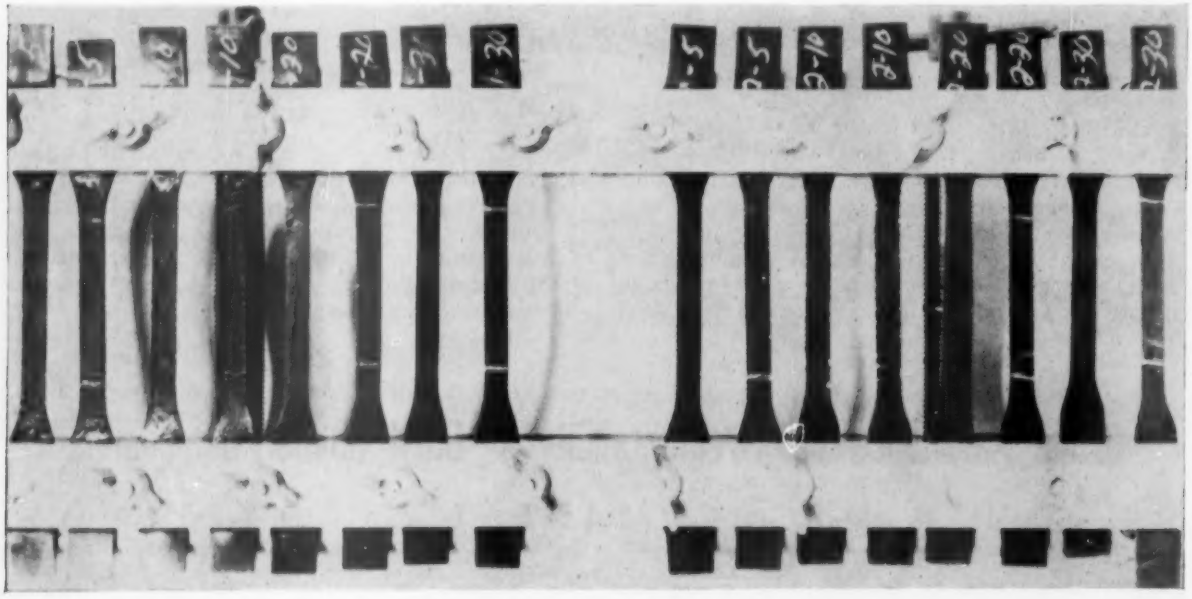


FIG. 1—Effect of cure time on ozone resistance of Enjay Butyl Rubber vulcanizates. The test was made in the 50 part per 100 million ozone chamber for 70 hours at 100°F.

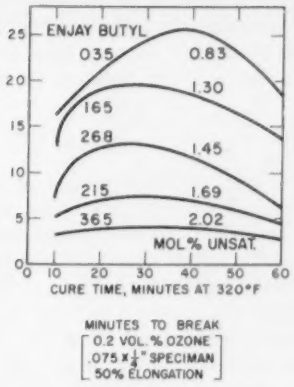


FIG. 2—Effect of polymer grade on ozone resistance.

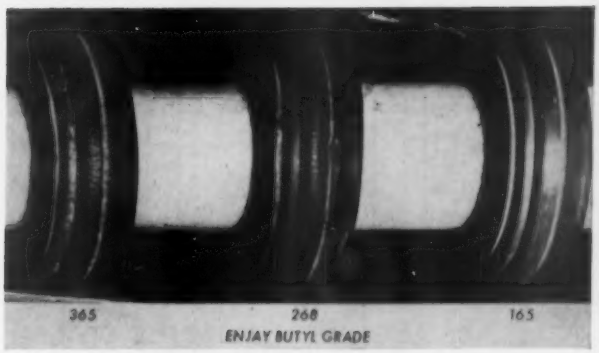


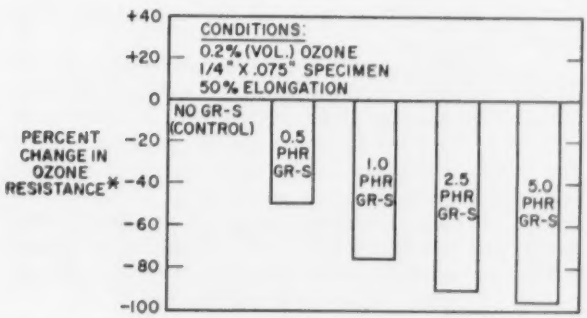
FIG. 4—Effect of GR-S type rubber on ozone resistance (% relative change).

have a pronounced effect on the ozone resistance of the compound. For optimum ozone resistance, then, one must obtain optimum state of cure for a given compound. Most of the so-called failures noted in the field can be traced directly to undercure.

Polymer Grade

Another important variable in compounding for maximum ozone resistance is the grade employed. As might be expected, the lower the unsaturation of the polymer the better is its ozone resistance. Figure 2 illustrates this point. Note especially the gain afforded in going from Enjay Butyl 365 to 268 to 165. This figure also shows the effect of state of cure very well. For all grades except 035, maximum ozone resistance is attained with a cure of about 20 to 30 minutes at 320°F. At this cure time, which is below optimum for Enjay Butyl 035, the 035 is only slightly superior to the 165 grade.

These data can be seen pictorially in Figure 3, which shows actual sections of weatherstrips (Chrysler design), extruded in a 1-A Royle and steam cured in talc for 40 minutes at 80 psi. The only variable here with regard to the control compound is polymer grade. Again, we see the pronounced effect in decreasing unsaturation from Enjay Butyl 365 to 268 to 165. The compound based on Enjay Butyl 165, which does show a slight tendency to crack, does not include other changes which will be found and presented in our subsequent discussion of this subject.



$$*\%\ \text{CHANGE} = \frac{\text{MIN. TO BREAK (SAMPLE)} - \text{MIN. TO BREAK (CONTROL)}}{\text{MIN. TO BREAK (CONTROL)}} \times 100$$

FIG. 3—Effect of polymer grade on ozone resistance of Enjay Butyl vulcanizates tested for 70 hours in the 50 part per 100 million ozone chamber.

While on the subject of polymer unsaturation, it is interesting to consider the effect of contamination by other polymers, such as GR-S type, as shown in Figure 4. Even at a level of contamination of 0.5 or 1.0 phr, which cannot be detected by changes in physical properties, the ozone resistance of the compound is drastically reduced. (These relative changes are all determined at optimum cure.) At present there is no way of detecting such low levels of contamination in cured stock. However, the necessity for good housekeeping and the desirability of employing a butyl clean-out batch in the mixer before running on butyl rubber is evident.

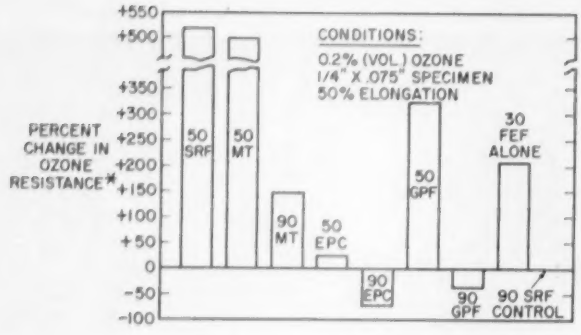
Carbon Black

Carbon black type and loading has a considerable effect on ozone resistance as shown in Figure 5. In all the compounds shown there are 30 phr FEF black in addition to the blacks indicated on the chart. Reducing the total black loading from 120 phr to 80 phr enhances the ozone resistance considerably. However, this great a reduction in black loading does result in a poorer extrusion. While this latter fact may be undesirable, the black loading could be reduced somewhat from the 120 phr total (e.g., to 100 to 110 phr) to give improved ozone resistance while maintaining excellent extrusion properties.

Channel blacks appear undesirable for optimum ozone resistance, while the use of a thermal black instead of a furnace black offers some improvement in ozone resistance but at the expense of extrusion properties and modulus. Therefore, the furnace blacks at a level of about 100 to 110 parts appear to be the best approach in developing this 75 to 80 hard black extrusion compound.

Plasticizers and Sulfur Level

Seven plasticizers (five petroleum oils, one coal tar derivative, and petrolatum) were evaluated for their effect on ozone resistance. Based upon the data in Figure 6, it



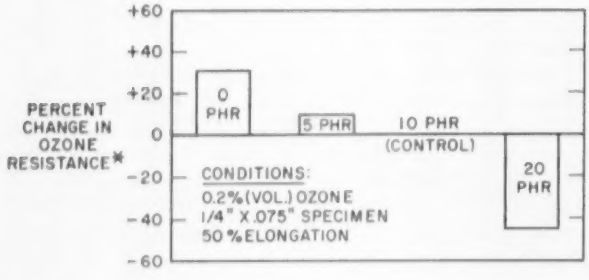
$$*\%\text{CHANGE} = \frac{\text{MIN. TO BREAK (SAMPLE)} - \text{MIN. TO BREAK (CONTROL)}}{\text{MIN. TO BREAK (CONTROL)}} \times 100$$

FIG. 5—Effect of carbon black on ozone resistance of Enjay Butyl Rubber vulcanizates (% of relative change).

appears that up to 10 phr of plasticizer is not too detrimental to ozone resistance. These values are typical for any of the plasticizers evaluated, except possibly petrolatum, which does show an advantage over some of the other oils at the 5 and 10 phr level, probably because of the greater reduction in modulus that this material affords.

Sulfur level exhibits a marked influence on the ozone resistance of Enjay Butyl Rubber vulcanizates. Certainly above 1.6 or so phr of sulfur, bloom problems will be encountered which cannot be overlooked in many applications. The more readily dispersed types of sulfur, such as Spider Sulfur, do show an improvement in ozone resistance and bloom characteristics over rubbermaker's sulfur, and are therefore recommended. It can be said concerning sulfur that the compounder should certainly use as much readily dispersed sulfur and sulfur donating materials as possible consistent with bloom properties desired.

The use of wax has been traditionally recommended for improved ozone resistance. However, unless a continuous bloom of wax remains on the surface and is not scratched off, this approach is not too practical. Also, in the case of steam cured vulcanizates, we noted that the wax film on the surface is greatly reduced, if existent at all. Therefore, it is advantageous to compound butyl for maximum ozone resistance without relying upon wax.



$$* \%\text{CHANGE} = \frac{\text{MIN. TO BREAK (SAMPLE)} - \text{MIN. TO BREAK (CONTROL)}}{\text{MIN. TO BREAK (CONTROL)}} \times 100$$

FIG. 6—Effect of plasticizer loading on ozone resistance of Enjay Butyl Rubber vulcanizates (% relative change).

This offers another advantage in such items as black weatherstrips, which are to be painted with a vinyl paint for decorative purposes. A wax film would certainly impair the adherence of the paint to the rubber.

Antiozonants

Antiozonants offer another means of enhancing the ozone resistance of a compound. Here again the antiozonant must be brought to the surface and remain there to be effective. The effective antiozonants we studied all proved to be staining and discoloring. Again, as with waxes, it is better to compound butyl rubber for its maximum ozone resistance without the use of additives.

It should be pointed out that the data shown in Figures 2, 4, 5, and 6 are based on exposure to 0.2 volume per cent ozone, which is certainly an exceptionally high concentration. It has the advantage of being a fast test and giving trends in compounding techniques, but the proof of the pudding essentially is in 50 part per 100 million tests and outdoor weathering itself. All of the trends and conclusions drawn here, based on the 0.2 per cent ozone cabinet, have been borne out by subsequent testing in the 50 part per 100 million chamber and have been generally confirmed by outdoor aging studies in Southern California, Florida, and New Jersey.

Of course, to anyone involved in weathering studies, the problems of correlating outdoor exposure with ozone chamber results are evident. Factors such as nitrous oxide, hydrocarbon vapors, sunlight, and the like have not been isolated directly in outdoor weathering studies. Considerable work is being done at the present time in this field.

Summary and Conclusion

In summary then, what are some of the most important lessons learned from this variable study? First and foremost, obtain the optimum state of cure for the compound in question. Use the lowest unsaturation grade of Enjay Butyl Rubber possible, consistent with cure rate and state desired; avoid any contamination from other polymers; use low black loadings, preferably of the furnace type, consistent with other desired properties, such as extrudability and physicals; keep the plasticizer content to a minimum, and choose carefully the cure system, using as much easily dispersed sulfur and sulfur donating materials as practical without encountering bloom.

As mentioned previously, these conclusions are not limited to black extruded items but apply to all butyl rubber compounding. The problem is not as acute in the case of mineral filled compounds where more latitude can be exercised, because the ozone resistance of these relatively unreinforced compounds is at a higher level than the black weatherstrip compound examined in this study. For example, it is not too difficult to compound a light-colored strip which runs well over 100 minutes in the 0.2 volume per cent ozone chamber.

In conclusion, then, the opening statement can be modified to affirm that by virtue of its inherent ozone resistance, a properly compounded butyl rubber stock exceeds the best compound currently available from other general purpose polymers from the standpoint of ozone resistance and weatherability.

Heat, Aging and Chemical Resistance of Enjay Butyl Rubber

By Charles E. Waggner

THIS question is often asked: "How resistant is butyl rubber to heat, and what are its limitations?" The answer to such a question depends on a number of variables with the conditions of exposure being a very important factor.

First, let us look at the polymer itself and see how it compares with other elastomers. Butyl rubber contains carbon to carbon linkages just as does natural rubber, GR-S type, neoprene, nitrile rubber, acrylics and other vulcanizable elastomers. It has been estimated that the carbon to carbon bond is stable up to about 600°F. This is an approximate figure and will vary according to the influence of the other substituents on the carbon atom in question, and is further influenced in rubber compounds by the protection offered by the fillers.

Looking further at the structure of butyl rubber, we find a much lower degree of unsaturation than is found in natural rubber, GR-S type or nitrile rubber. This makes butyl rubber much less susceptible to oxidation. Oxidation of the double bonds in natural rubber and GR-S type causes cross-linking and hardening of the vulcanizate. Butyl rubber does not undergo this type of change and is very stable in the presence of oxygen.

Instead of hardening under conditions of severe heat, butyl rubber tends to soften. This is not due to polymer degradation but rather to breaking the cross-links (reversion) formed during vulcanization. A sample of raw butyl rubber having a viscosity average molecular weight of 305,000 exhibited no decrease in molecular weight after being heated in a press for 10 minutes at 400°F. These conditions will cause a marked reversion in a sulfur-cured vulcanizate. Hydrogen sulfide, which is formed during vulcanization, is known to react with organic disulfides according to the following equation:

$$R\text{-}S\text{-}S\text{-}R + H_2S \rightarrow 2RSH + S$$

Zinc oxide effectively reacts with hydrogen sulfide, thus inhibiting this reaction. For this reason 15 to 20 parts of zinc oxide is usually used in heat resistant formulations. Under conditions of high temperature curing (375 to 400°F.), this may not be desirable, since zinc oxide will compete with the polymer for sulfur and a low state of cure will result. At higher temperatures, the use of oxidizing agents has been shown to be effective in preventing the breakdown of the disulfide linkages. Calcium peroxides have been shown to be particularly effective.

Since heat degradation of butyl rubber is the result of the breaking of disulfide linkages, the rate of degradation (or useful life) will depend on the number of such linkages initially present. Therefore, it would appear desirable to use the highest unsaturation grade possible considering other properties desired. This, in fact, is true. Enjay Butyl Rubber 325 (365) is the most heat resistant of the butyl polymers, as shown in Figure 1, where we see the retention of Shore hardness after three steam-air aging cycles highest for this compound. One aging cycle consisted of an eight hour exposure in steam at 100 psi followed by an 8 hour exposure in air at 260°F. and 80 psi.

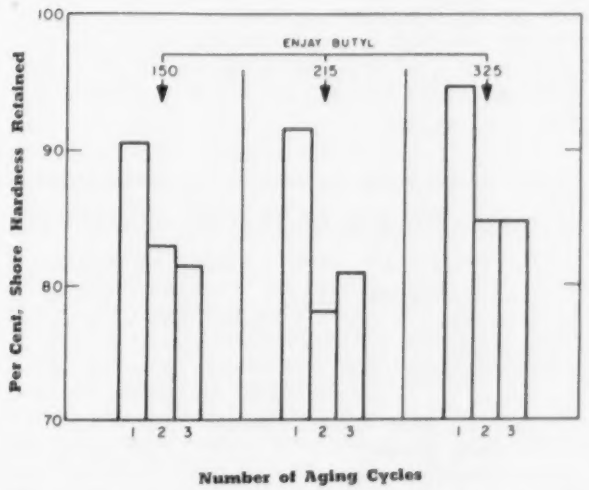


FIG. 1—Effect of polymer type on heat aging properties of Enjay Butyl Rubber.

Choice of Filler

The choice of filler can also play an important part in heat aging. Generally speaking, mineral fillers should be used only where the aging conditions are mild; blacks are preferred for high temperature aging. Fine and medium diameter furnace blacks are the best for heat stability. Generally 60 phr is used. The highest retention of physicals is obtained with the fine and medium thermal blacks. However, it must be remembered that original physicals are also lower with this type of load-

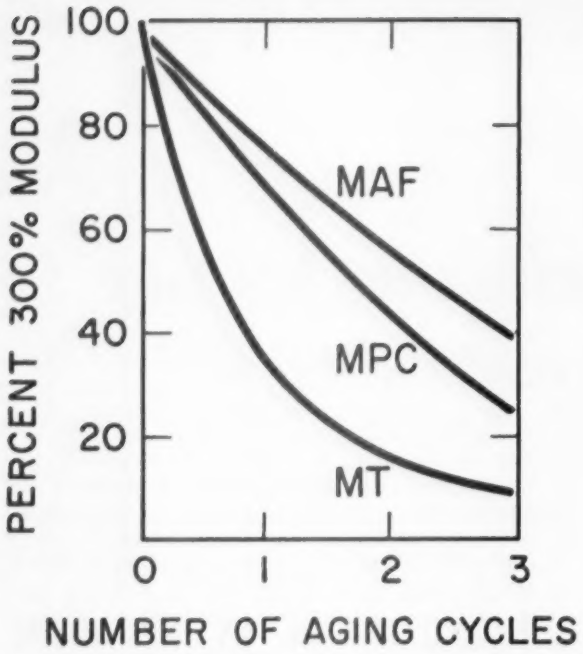


FIG. 2—Effect of type of black on heat aging properties of Enjay Butyl Rubber.

ing. Of the blacks, MAF gives the best heat aging, as shown in Figure 2.

While mineral filled stocks do not exhibit the same degree of heat stability as do black loaded stocks, under milder heat-aging conditions they still have excellent properties. Generally the hard, small diameter silicates are best. Since the stability of the vulcanization cross-link is the weakest part of the vulcanizate toward high temperatures, the choice of cure systems is an important one. The quinoid type cure utilizing p-quinone dioxime or its dibenzoyl salt results in a much more stable linkage than does the conventional sulfur cure. If staining or discoloration is not a prbolem, this system should be utilized. If staining and discoloration is a problem, tellurium diethyl dithiocarbamate should be used as an accelerator, as it gives a more stable linkage than the disulfide linkages obtained with tetramethyl thiuram disulfide and similar accelerators.

Still another cure system utilizing Amberol ST 137 (isoctyl dimethylol-phenol resin) in combination with specific metallic halides, such as the dihydrate of tin chloride, is reported to give excellent heat aging properties with a very low permanent set. This, in fact, is covered by U. S. Patent 2,726,224 issued to Peterson and Betts of the U. S. Rubber Company. Here again, the approach is to depart from the more common disulfide linkage.

Additions of 5 phr of Vistanex L-100, an 81,000 to 99,000 Standinger molecular weight polyisobutylene, give a marked improvement in heat aging with a sulfur cure system. After as many as six bomb aging cycles, the stock containing 5 parts L-100 has 54% of its original Shore hardness, while the control had only 27% retention. One bomb aging cycle is: (1) A 15 minute rise in steam to 400°F.; (2) A 15 minute period in steam at 400°F., and (3) A 30 minute air exposure at 200 psi, temperature being allowed to fall to 300°F.

Since Enjay Butyl Rubber compounds soften on heat aging, the addition of 5 pph of GR-S type or natural rubber will tend to counter-balance the softening, yielding a compound with a constant Shore hardness. GR-S type or natural rubber should not be used in compounds where ozone resistance is also desired. Since state of cure is of prime importance in heat resistance of butyl rubber, stearic acid should be eliminated as a processing aid, as this is a cure retarder. Table I summarizes the main points which should be considered in compounding for heat resistance. The compounds listed in Table II are suggested as good heat aging compounds for the conventional cure systems. This quinoid cure is quite scorchy and a compromise may have to be made to obtain safe processing.

Limitations of Butyl Rubber

We have discussed what happens to butyl rubber on heat aging, and how best to compound for heat aging. We have said nothing as to the limitations or what conditions are most severe. Every application has its own conditions and across-the-board comparisons are difficult. In general, butyl rubber tends to lose tensile gradually with time, while the elongation drops off rapidly and reaches an equilibrium ultimately giving backup as reversion sets in. The Shore hardness will show a gradual decrease with high temperature aging.

In Figure 3 we have plotted the retained tensile and elongation values for 300° and 400°F. oven aging of a

TABLE I—COMPOUNDING ENJAY BUTYL RUBBER FOR HEAT RESISTANCE

1. Highest unsaturation grade practical.
2. Zinc oxide—15 to 20 parts.
3. Cure:
   a. Quinoid type preferred.
   b. Sulfur cure best with TDEDC.
4. Fillers:
   a. MAF black preferred.
   b. Mineral fillers good only for mild conditions.
5. Addition of Vistanex (5 to 10 parts).

TABLE II—RECOMMENDED HEAT AGING COMPOUNDS

	Sulfur Cure	Quinoid Cure
Enjay Butyl Rubber 325	100	100
MAF black	60	60
Zinc oxide	25	25
Vistanex L-100	5	5
Sulfur	2	2
Tellurium diethyl dithiocarbamate	3	..
P-quinone dioxime	..	2
Benzothiazyl disulfide	..	4
Lead peroxide	5	5

typical insulation compound employing a quinoid cure. It should be noted that this compound contains clay loading for electrical properties and is not up to the levels obtainable with black loaded compounds. At both temperature levels, we find the tensile strength dropping off steadily with time, but the elongation takes its greatest loss early in the aging period. This is the property which enables butyl to retain its utility after short periods of very high temperature aging. Specialty polymers, such as the silicones, continue to cure and become very short during aging at 400°F. It is at these higher temperatures that butyl compares most favorably with the specialty elastomers, such as the silicones.

At a recent panel discussion in Akron, the following data were presented by E. W. Bartholomew, Wright-Patterson Air Force Base:

"The order with respect to the aging temperature at which 25% of the original tensile strength is lost after heat aging for eight hours of various polymers is as follows:

	°F		°F
Silicone	480	Neoprene	325
Hypalon	350	Polyurethane	280
FBA Polyacrylic	345	LTP GR-S	275
Nitrile rubber	340	Hevea	210
Butyl rubber	335	Vyram	Embrittled

The temperature at which 50% of room temperature tensile is retained follows:

	°F		°F
Butyl rubber	330	LTP GR-S	197
Silicone	323	Nitrile rubber	170
Hevea	277	Hypalon	163
FBA Polyacrylic	277	Neoprene	142
Polyurethane	222		

At temperatures as low as 158°F. butyl rubber exhibits a vast superiority to natural and GR-S type rubbers in air and especially in oxygen bomb aging."

Chemical Resistance

The low unsaturation of Enjay Butyl Rubber (1 to 3% of natural rubber) gives it unique properties for applications requiring maximum resistance to chemical attack. Since chemical attack usually occurs through the double bond of an unsaturated hydrocarbon, it would be expected that a nearly saturated hydrocarbon such as Enjay Butyl Rubber 035 would be extremely inert to chemical attack.

Enjay Butyl Rubber is unusually resistant to acids. Where high acid resistance is needed, modifications in compounding or curing can effect substantial increases with regard to this characteristic.

Butyl rubber has excellent resistance to oxygenated solvents such as ketones, esters and alcohols. Resistance is fair to certain aromatics and halogenated solvents. As would be expected from the similarity in chemical structure, aliphatic hydrocarbons cause swelling, but where this property is not of prime importance, Enjay Butyl Rubber can be used satisfactorily. It is remarkably resistant to most oils of non-mineral origin and exhibits low swell in vegetable and animal oils.

Acid resistant butyl rubber gloves have long life and protect the worker. Dairy boots made from butyl rubber resist animal fats and abrasive wear. Gaskets are effective seals to many fire resistant hydraulic fluids which have recently been introduced. Many types of gas masks

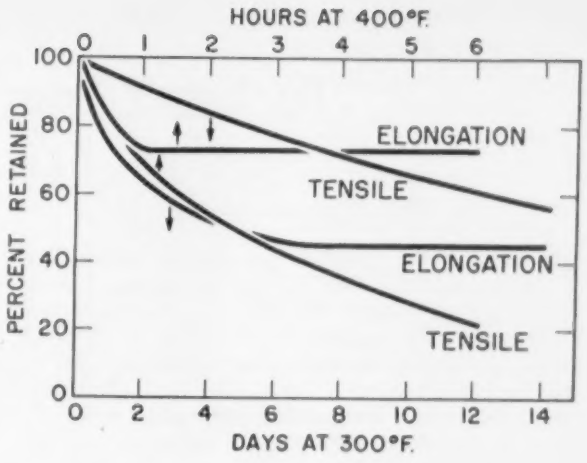


FIG. 3—Retained tensile and elongation values for 300°F. and 400°F. oven aging of a typical insulation compound employing a quinoid cure.

employ butyl polymer because of the resistance to chemical attack and low gas permeability. Conveyor belts that carry chemicals are often made of butyl rubber.

Butyl rubber may be used to advantage in contact with 37% HCl, 70% HNO_3, 85% H_3PO_4, 85% lactic acid, and tricresyl phosphate. At temperatures of 140°F. and above butyl rubber shows poor resistance to oxidizing agents such as HNO_3.

Factors Affecting Chemical Resistance

Grade of Polymer. Very low unsaturation grades of Enjay Butyl (035 and 150) exhibit the best acid resistance, while the faster curing grades (215, 217, 218 and 325) are preferred for commercial handling.

Fillers. The choice of filler is an important factor contributing to the chemical resistance of the cured vulcanizate. The higher surface area furnace blacks yield vulcanizates having low volume swell and should be utilized for good chemical resistance wherever possible. Filler loadings only to the extent necessary for processing (20 to 30 volumes) should be used for acid resistant applications. Heat treatment, i.e., thermal interaction of blacks with the polymer using a chemical promoter, improves acid resistance. High filler loadings improve resistance to organic chemicals. Mineral fillers possess little or no ability to restrict swelling of a vulcanizate and should be avoided in compounds where good chemical resistance is required. Chemically reactive fillers such as carbonates naturally must be avoided.

Curatives. In many cases, non-sulfur cures exhibit improved chemical resistance over the conventional sulfur cure. The surfur cure is superior in the case of exposure to strong oxidizing agents such as sulfuric or nitric acid. However, a p-quinone dioxime-benzothiazyl disulfide-red lead cure exhibits good resistance to sulfuric acid and to organic chemicals.

Mr. Waggner concluded his address with comments on the processing of Enjay Butyl Rubber, with particular attention to Banbury and mill mixing, selection of plasticizers, heat treatment, extrusion and calendering

The Dynamic Properties of Butyl Rubber

By R. L. Zapp

TO introduce the subject of the dynamic properties of butyl rubber let us rst refer to Figure 1 where elastic systems are symbolically diagrammed. These include an undamped spring mechanism, a damped spring mechanism, and a highly damped spring mechanism. For the isolation of vibration, a steel spring is a satisfactory mechanism except for one deficiency—the danger of a resonant frequency magnifying the amplitude of vibration. This is shown at the left. For frequencies removed from the resonant frequency, shown by the center arrow, only small vibrational amplitudes would be transmitted from one section of the mechanism to the other.

In an undamped system, such as this, when the forced frequency of vibration equals the natural frequency of the system, the magnification factor approaches infinity. This is indicated by the following equation:

$$\text{Magnification Factor} = \frac{\text{X Dyn.}}{\text{X St.}} = \frac{1}{\left[\frac{4\eta^2 Wq^2}{Wn^4} + \left(1 - \frac{Wq^2}{Wn^2}\right)\right]^{1/2}}$$

wherein η is zero in an undamped system and thus the whole fractional term can become infinite when Wq = Wn. The terms in the equation have the following meaning:

X Dyn. = dynamic deflection.
X St. = static deflection.
η = damping factor.
Wq = frequency of applied force.
Wn = natural frequency of system.

Damped Systems

In contrast to this, a damped system such as the one shown in the center of Figure 1 gives some assurance that resonant frequencies will not build up a transmitted amplitude to destructive proportions. This is shown mathematically in the first series of terms in the denominator of the equation. The damping factor, η, makes this ratio always greater than zero so that the magnification factor can never approach infinity. On the right of Figure 1 it is shown that in a more highly damped system resonant frequency can build up only smaller amplitudes.

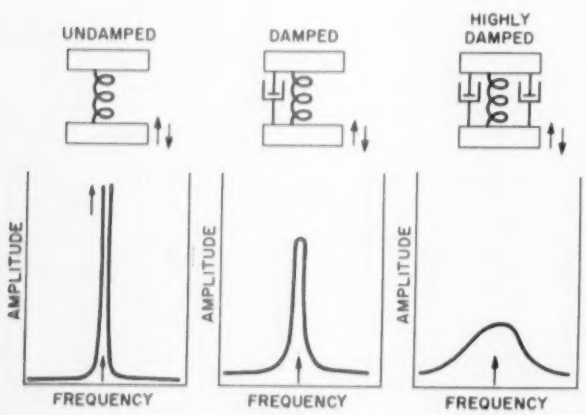


FIG. 1—Schematic of elastic systems.

The center and right sections of the figure are representative of rubber vulcanizates. One can consider the center to be natural rubber and the more highly damped system to be butyl rubber. For frequencies removed from resonance, the natural rubber compound would isolate vibration well. However, its lower damping factor presents the possibility that higher resonance amplitudes could be encountered than with butyl rubber.

Shock Absorbing Properties

Rubber parts are also called upon to operate as shock absorbing members as well as vibration dampers. The higher damping factor generally encountered in butyl rubber compounds absorb shock energy more completely. The article made from butyl rubber would necessarily have to be designed to take care of higher heat buildup.

A pictorial representation of rubber behavior under dynamic conditions is shown in Figure 2. It is a typical force displacement diagram of an extension-retraction cycle. The double-cross hatched oval area is the work lost in completing the cycle. The total work of deformation is represented by the total area and the relative damping, or the amount of work lost to the total work of deformation, is shown by a ratio of the oval area to the total area.

Mathematically, the graphical picture can be expressed by the equation % relative damping = $2/1 + (2K/\pi^2\eta f) \times 100$, where K is the dynamic modulus; η, intrinsic viscosity, and f, the frequency of vibration. The oval area is expressed in the first term adjacent to the absolute damping, or the area surrounded by the oval. It will be observed that this expression contains the symbols η times f. The other symbols in this expression are geometric—the area of the test piece, the amplitude and the height. Therefore, the absolute damping or the work lost is directly related to η f, that is, to internal viscosity times frequency.

Natural rubber compounds when subjected to forced vibration would, in general, display a smaller oval area than a corresponding butyl compound, indicating that a greater portion of the work of deformation is transformed to heat at normal room temperatures. We say ordinary temperatures or room temperatures of operation because the resilience or hysteresis loss of butyl rubber vulcanizates is greatly altered with increasing temperature. Butyl rubber becomes more resilient

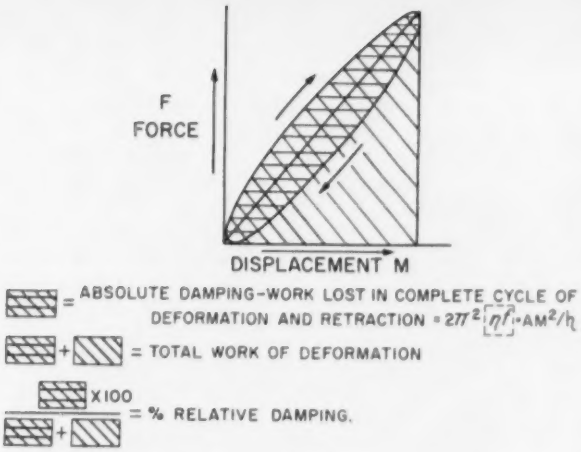

F
FORCE
DISPLACEMENT M
= ABSOLUTE DAMPING-WORK LOST IN COMPLETE CYCLE OF DEFORMATION AND RETRACTION = $2\pi^2[\eta f]\cdot AM^2/h$
+ = TOTAL WORK OF DEFORMATION
X100
+ = % RELATIVE DAMPING.

FIG. 2—Typical force displacement diagram of an extension-retraction cycle representing rubber behavior under dynamic conditions.

or has lower hysteresis loss as temperature of operation rises. This is shown in Figure 3. Here absolute damping indicated by the product of viscosity times frequency is plotted as a function of frequency with temperature as the parameter.

Dynamic Properties of Butyl Rubber

First, let us consider the curves for butyl rubber. As temperature is increased from 25° to 75°C., the over-all hysteresis loss indicated by ηf is drastically lowered. In addition, the frequency dependence is changed as temperature is increased. At room temperature, for example, the butyl rubber vulcanizates are quite frequency dependent, and as temperature rises not only does hysteresis loss go down but it becomes less frequency dependent. The dotted lines are representative of a hypothetical natural rubber compound. The resilient qualities of natural rubber are more nearly alike at 25° and 75°C. It is less temperature dependent and, as shown by the slopes of the curves of the line, natural rubber compounds are far less frequency dependent.

This frequency and temperature dependence exists at much higher frequencies, as shown in Figure 4. We are dealing here with audio frequencies. Hysteresis loss, or damping, is measured by an attentuation of sound. These data of Witte, Mrowca and Guth [*J. App. Physics*, Vol. 20, p. 481 (1949)] compare buytl rubber and GR-S vulcanizates at 40° and 68°C. The curves show that butyl rubber vulcanizates have a much higher damping factor for audio frequency vibrations than GR-S. Figure 4 also displays the greater temperature dependency of a butyl rubber vulcanizate. The butyl rubber curves are farther apart than the GR-S curves.

It also can be noted that the average slopes of the GR-S lines are much smaller; that is, these vulcanizates would be less frequency dependent. This higher damping of audio frequencies by butyl rubber can be utilized in sound damping. Indeed, this feature of butyl rubber contributes to the lower noise level of our experimental butyl rubber tires.

TABLE I—DYNAMIC PROPERTIES OF BUTYL AND NATURAL RUBBER VULCANIZATES CONTAINING 50 PARTS OF CHANNEL BLACK AND 5 PARTS OF OIL (16 CPS AND 50°C.)

	Butyl Rubber		
	Normal	Heat Treated	Natural Rubber
Tensile	3200	3140	4300
Modulus	800	1400	1735
Elongation	650	530	560
Dynamic Modulus (Dynes x 10^{-7})	3.8	2.7	4.1
% Relative Damping	42	35	28
Internal Viscosity	13.0	7.6	8.5

Alternation of Dynamic Properties

The dynamic properties of butyl rubber can, of course, be greatly altered by compounding. Plasticizers, either oils or aliphatic esters, reduce the hysteresis loss of vulcanizates. The method of mixing butyl and carbon black also greatly alters the hysteresis properties. We refer here specifically to the heat treatment of butyl rubber-carbon black masterbatches, most recently made practical by the use of the chemical promoter, Elastopar.

In Table I physical properties of two butyl rubber compounds are compared to a natural rubber compound.

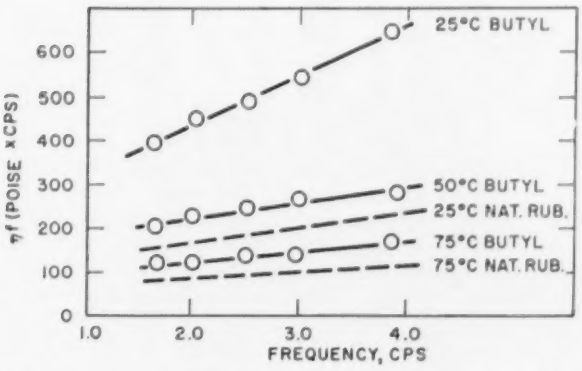


FIG. 3—Hysteresis loss—frequency and temperature dependence.

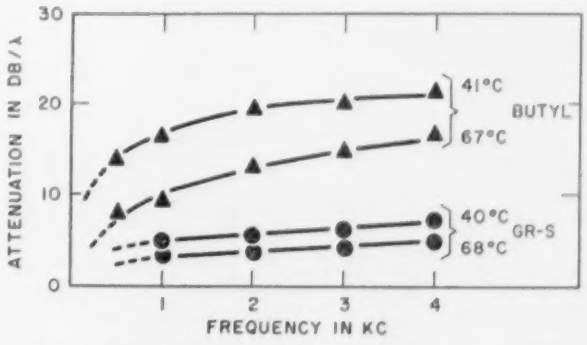


FIG. 4—Damping at higher frequencies (based on data of Witte, Mrowca and Guth).

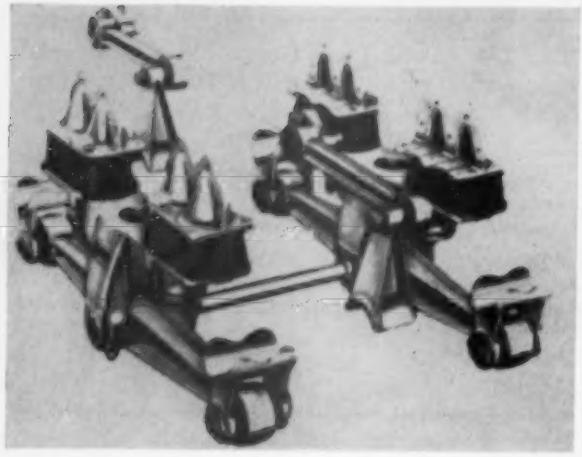


FIG. 5—Rubber load bearing member in a Hendrickson trailer truck.

All compounds contain 50 parts of channel black and 5 of oil. One butyl rubber compound is a normal Banbury mix, and the second butyl rubber compound is a heat-treated butyl rubber-carbon black mix promoted with one part of Elastopar.

Tensile, modulus and elongation values are presented for comparison. The effect of heat treatment on the butyl rubber compound is most graphically shown by the increase in modulus at 300% extension. The three lower rows of figures compare dynamic properties of the two butyl rubber compounds with that of natural rubber. The dynamic modulus or softness is reduced by heat treatment as shown. This is indicative of a more flexible nature of the vulcanizate. Relative damping or hysteresis loss is also reduced by heat treatment as is the internal viscosity.

Butyl rubber vulcanizates with a large range of dynamic properties can thus be produced by altering the type of carbon black pigment, the degree of heat treatment, and the incorporation of plasticizer. In general, however, butyl rubber vulcanizates are dynamically softer than corresponding GR-S type rubber and natural rubber vulcanizates containing the same volume and type of pigment. This is shown when a comparison is made between the dynamic constants of the natural rubber compound and those of the butyl rubber. The natural rubber compound is dynamically harder but more resilient. This is shown by the values 2.7 and 4.1 for the dynamic modulus and the values 35% and 28% for the relative damping. These constants were determined at 16 cycles per second at 50°C.

This quality of lower dynamic modulus or higher dynamic softness coupled with greater energy absorption can be utilized in the design of shock absorbing members or parts. A butyl rubber shock absorbing member can operate through a greater deflection absorbing more energy in the process.

Such a combination has been commercially utilized in the design of rubber load bearing members in trailer trucks, shown in Figure 5. These load cushions, developed by Hendrickson Manufacturing Co., replace the steel leaf assembly. The load cushion gives a soft, easy ride within the complete range of loads. These members utilize the greater dynamic softness and higher energy absorption of butyl rubber vulcanizates to produce this effect. This butyl rubber quality of dynamic softness coupled with higher energy absorption contributes to the superior riding qualities of the present experimental butyl rubber tires.

Richardson Bell-Shaped Weigh Hopper

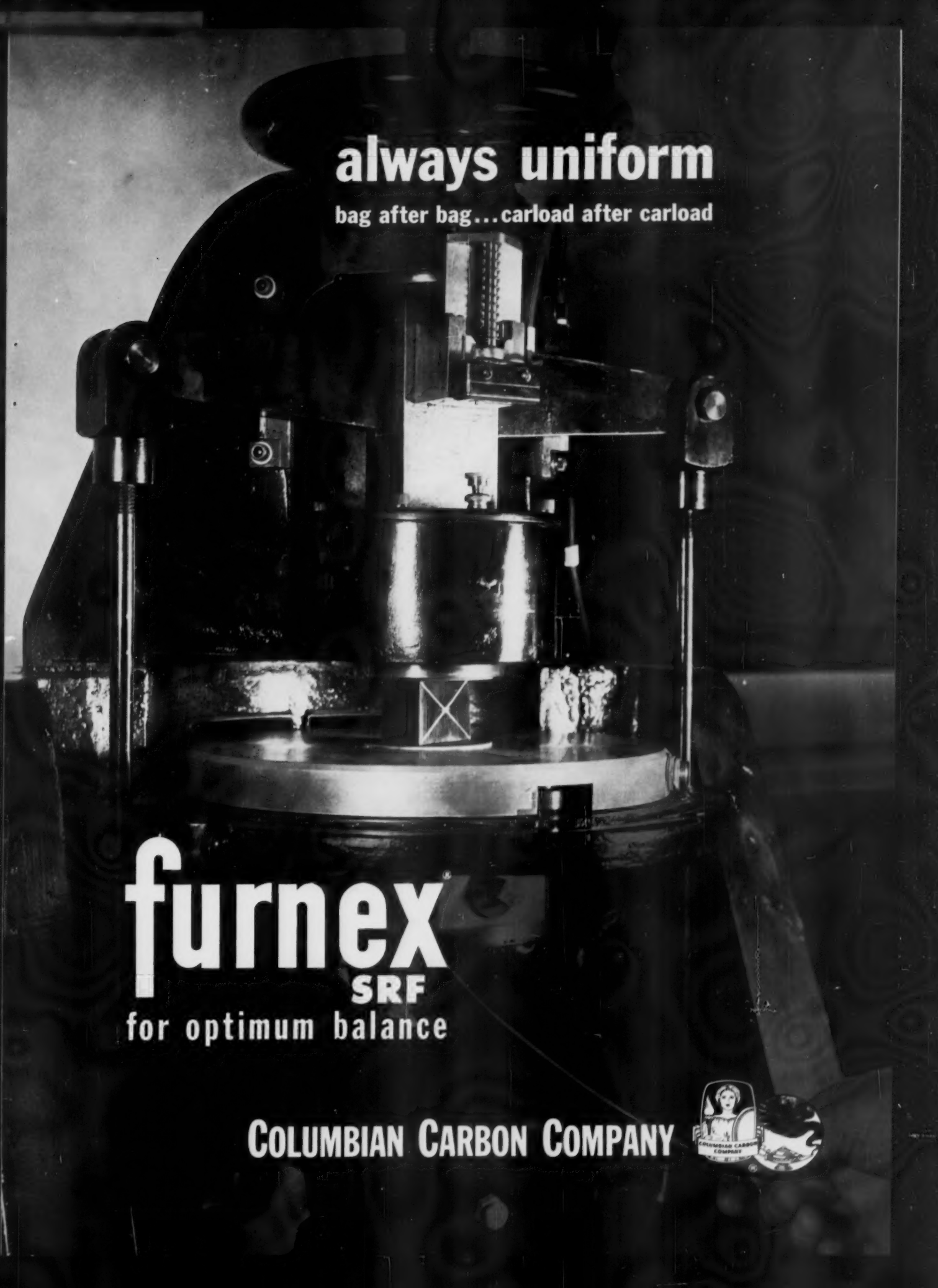
Accurate weighing and thorough discharge of fluffy or sticky materials is said to be provided by a new bell-shaped weigh hopper with motor-driven screw discharge mechanism manufactured by the Richardson Scale Co., Clifton, N. J. The new unit, which was designed for such difficult to handle material as rubber crumbs, long asbestos fibers, and similar non-free-flowing materials, has three bell-shaped sides and one straight side, permitting unrestricted flow of material. This design counteracts tendency of fluffy materials to arch in a hopper with four straight sides. A variable pitch screw feeder provides "live bottom" discharge from the hopper. Screws are driven by a fully enclosed gearhead motor.

The weigh hopper is fully enclosed for dust-proof operation, with operating levers outside the weighing chamber. It is suspended from a set of beams and terminates in a dial head. The hopper can be fed from a bucket elevator, screw feeders or other conveyors, depending on the user's requirements. It can be discharged manually (by push button) or automatically with a mercury magnetic cutoff. A potentiometer cutoff is provided when the hopper is used in conjunction with Richardson's Select-O-Weigh automatic proportioning system.

Johnson Quick Release Nipples

A new quick release nipple for use with its rotary pressure joints has been developed by the Johnson Corporation of Three Rivers, Mich. The new nipple is said to greatly simplify the task of connecting joints to journals on rubber mills, calenders, paper machines and similar units where the company's joints are used to admit steam or liquids under pressure to rotating rolls or drums.

The new unit, generally referred to as the "Q" nipple, consists of three parts—a journal flange, a tapered split ring and a nipple flange. The journal flange is fastened to the journal with countersunk cap screws. It has a recess into which the nipple fits, and threaded studs on which the nipple flange is fastened. The tapered split ring is wedge-shaped in cross-section. The two halves fit into a recess in the nipple, and bear against the shoulder at bottom of this recess. The nipple flange slides over the tapered split ring, and onto the threaded studs of the journal flange. When the nuts on the studs are drawn up, the wedging action between the nipple flange and the tapered split ring exerts a tremendous force to lock the nipple securely in position. The nipple can be disassembled, and joint removed, simply by backing off the nuts.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Editorials..

False Economy

► THE HOUSE of Representatives has passed and sent to the Senate a bill killing all of the Administration's requested funds for the operation of the twenty-five industry divisions of the Business and Defense Services Administration. If this measure passes through the Senate, Congress will have succeeded in putting out of business the Rubber Branch, an organization which has been continuously identified with the Department of Commerce since it was instituted thirty-six years ago by the then Secretary of Commerce, Herbert Hoover. One result of this action would be the termination of the government's collection, collation and distribution of statistics on rubber. These statistics have been issued monthly by the government for the past fifteen years.

In its present operations, the Rubber Branch is responsible by Presidential directive to both the Department of Defense and the Office of Defense Mobilization for a wide range of tasks in the area of mobilization planning and defense preparedness. These tasks range from providing data as a basis for stockpile decisions to periodic estimates of civilian and military requirements for rubber. The Chemical and Rubber Division of BDSA also has the responsibility of recruiting and training the Rubber Industry's National Industrial Executive Reserve for emergency service in event of atomic attack.

In addition to their use in governmental planning, statistics made available through the Rubber Branch have been widely used by the rubber industry itself. Producers and consumers, traders, manufacturers of synthetic rubber, reclaimers, scrap dealers, companies in the chemical, transportation, petroleum, banking, automotive and advertising fields, have all been materially assisted in their forward planning by the statistics and other information made available by the Rubber Branch.

There seems to be little question that the government's responsibility to the business community extends to the issuance of information and advice. Many individual companies in the rubber industry and the industries allied with it are not in a position to perform this type of service for themselves. The government, and only the government, is in a position to seek out relevant statistics and pass them on to all interested parties.

It is evident that if individual companies were forced to perform this necessary service for themselves, duplication of effort and the annoyance of completing competing questionnaires would soon call a halt to the whole procedure. It should be said that while the trade associations do furnish statistical information, the material is often limited in that it may take into account only member companies. In addition, material of this sort frequently has a limited distribution. Above and beyond all this, companies will frequently divulge information to the government they would be hesitant to reveal otherwise.

It is true that in these days of budget-cutting, the temptation is to be all for economy until one's own precinct is invaded. It must be said, however, that there are some fields in which the government does indeed operate most efficiently. Certainly, the collation of statistical information of the type we have been discussing falls most reasonably in the government's lap.

Many other factors other than the distribution of statistical information are at stake here. It is not clear, for example, just where the Office of Defense Mobilization would elect to transfer the responsibility for administering allocation and materials control if the industry divisions of BDSA are liquidated. There has been some suggestion that these activities might be transferred to the Department of Defense rather than to some civilian agency.

Relating our discussion solely to the matter of statistics, however, it should be impressed upon our Congressional leaders that to deprive the rubber industry of valuable statistical information at this time will work a real hardship. While we would not suggest other areas for budget-cutting, the Rubber Branch of BDSA does not seem to be the most reasonable point to start economizing. And what is involved for the operation of the Rubber Branch for a given year? Less than $75,000.

Modern Design

► READERS will note a number of changes in the appearance of this issue of RUBBER AGE. This page, for example, appears in a new type face and under a new heading. Other changes will be noted in the presentation of the feature articles, in our table of contents and elsewhere throughout the magazine. In future issues, we plan to make additional changes in type and format, changes designed to increase the readability and the effectiveness of this journal. It should be noted that while we have changed the physical appearance of this magazine, the standards under which we determine the suitability of material for publication have not changed. We will continue to stress both quality and purpose in the presentation of all printed material.

Since we exist solely as a service to the reader, it is the reader who must ultimately pass on the style changes we are adopting. To that end, we would appreciate hearing from our subscribers. Is this issue of RUBBER AGE more pleasing to the eye? Is it easier to read? Are there any changes *you* would like to see incorporated into our new format? Your opinions will help us materially. May we hear from you?

Highlights Sidelights *of the News...*

May, 1957

A suggestion that Congress consider reactivation of twelve idle alcohol and butadiene plants under a program to utilize surplus grains has been withdrawn by the President's Bipartisan Commission on Increased Industrial Use of Agricultural Products . . . The plan was abandoned in favor of a program of "vigorous research to determine costs and discover outlets in this field" . . . The plan, if followed, would have brought government sponsored activation of ten privately-owned industrial alcohol plants, and one privately-owned and one government-owned alcohol-butadiene plant (page 301).

A strike called by the URW against the B. F. Goodrich Co. in Akron and eight other cities throughout the nation ended on April 15 with the signing of a new two-year contract . . . The strike, which began on April 1, had idled 8,000 workers in Akron alone . . . The new contract calls for a number of improvements in working conditions . . . Wages were not an issue in the strike (page 303).

H. K. Porter Co. has acquired the Federal Wire & Cable Co., Ltd. of Guelph, Ont., Canada . . . The acquisition of Federal, Canada's fourth largest wire and cable manufacturer, was made by H. K. Porter Co. (Canada) Ltd., a wholly owned Porter subsidiary . . . Harold F. Nunn, vice-president and general manager of Porter's Canadian organization, will supervise the new operation in addition to his other responsibilities (page 326).

The production of synthetic rubber will overtake natural within ten years in the view of William S. Richardson, president of the B. F. Goodrich Co. . . . He believes that there is not enough natural rubber in sight to take care of increasing world demand . . . Mr. Richardson also sees the production of 110,000,000 pneumatic tires in the United States in 1957 (page 301).,

Seiberling Rubber Co. is actively seeking the acquisition, by purchase or merger, of another company in a related field . . . Company officials indicate that steps have already been taken to speed up the search for such a company (page 318).

Goodrich has announced plans to spend an estimated $41 million in 1957 in expanding its plants, building new ones, and in other projects . . . The capital and investment expenditures in 1957 will be 10% higher than in 1953 . . . This year's projects are part of a $200 million five-year program launched in 1956 (page 308).

NEWS REPORTS and Industry Activities

BIPARTISAN GROUP WITHDRAWS ALCOHOL FROM GRAIN PROPOSAL

The President's Bipartisan Commission on Increased Industrial Use of Agricultural Products has withdrawn its suggestion that Congress consider reactivation of 12 idle alcohol and butadiene plants under a huge program to utilize surplus grains. The bipartisan commission reported to Congress that it could not agree "upon a specific recommendation" for activation of the plants. Instead, the plan was abandoned in favor of a program of "vigorous research to determine costs and discover outlets in this field."

At the same time, the group also refused to recommend a program for utilizing surplus grains by blending alcohol with gasoline for motor fuel. In its interim report to Congress and the President, it said: "The commission has not found any encouragement for believing that, in the present state of knowledge and under current economic conditions, the use of industrial alcohol for motor fuel can be justified. It appears clear that the cost to the public would far outweigh the possible advantages."

Sources at the commission said the fact-sheet sent to the Senate Banking Committee some weeks ago on an alcohol butadiene program was nothing more than an "expression of interest" by the commission. Failure of the group to follow it up with a recommendation, with emphasis instead on research, was seen as a compromise move within the commission.

Seek Authorizing Legislation

The original document, however, has already been followed up by a move to get authorizing legislation, and hearings before the Senate Banking Committee will probably be held in the near future. A bill, co-sponsored by Senators Carl T. Curtis (Rep., Neb.) and Paul Douglas (Dem., Ill.), would bring Government-sponsored activation of 10 privately-owned industrial alcohol plants and two alcohol butadiene plants, one privately-owned and the other privately-operated under lease from the Government. The commission estimates the plants could use at least 98,000,000 bushels of grain annually, without affecting present markets, to produce both industrial alcohol and butadiene for synthetic rubber, paints and plastics.

In burying the possibility of alcohol-gasoline blending to have motorists use up grain surpluses, the commission said it "fully" realized the appeal of the motor fuel approach. In fact, it estimated that a 10 per cent alcohol blend would consume two billion bushels annually. However, the commission found that any program would have to be funded by the Government at about $2 billion with an added cost to the public of about the same amount.

RD Meeting Papers Deadline

The Division of Rubber Chemistry of the American Chemical Society has announced that the deadline for abstracts of papers to be presented at the Fall Meeting in New York City is June 21. The meeting, to be held from September 11-13 at the Hotel Commodore, will be held jointly with the meeting of the parent society. Abstracts of papers planned for presentation at the meeting should be submitted to S. G. Byam, Acting Secretary, c/o E. I. du Pont de Nemours & Co., Inc., P. O. Box 406, Wilmington, Del.

To Sell Government Laboratory

The General Service Administration has decided to offer the government owned rubber research laboratory and pilot plant in Akron, Ohio, for sale to the highest bidder. GSA will open bids on May 23 for the 13 buildings which total 53,412 square feet of space. Machinery and equipment is also being put on the block. The unit was built in 1943 and operated by the government from 1944 through 1955. The Senate Banking and Currency Committee recommended its sale on July 11, 1956, and the 84th Congress approved of its disposal on July 26, 1956.

Court Rules In Plymouth's Favor

Following two years of court action in a patent suit brought by Minnesota Mining & Mfg. Co., St. Paul, Minn., the United States Court of Appeals for the Fourth Circuit has ruled that Plymouth Plastic Electrical Tape, manufactured by the Plymouth Rubber Co., Inc., Canton, Mass., does not infringe Minnesota Mining's Patent No. 2559990. The court further ruled invalid the added claims on reissued Patent No. RE 23843, if construed to cover such Plymouth tape.

SEES SYNTHETIC PRODUCTION TOPPING NATURAL BY 1965

The production of synthetic rubber will overtake that of natural rubber in less than ten years, Williams S. Richardson, president of the B. F. Goodrich Co., stated on April 29 in an address before the New York Society of Security Analysts. Mr. Richardson said: "There is not enough natural rubber in sight in the rubber-growing areas of the world to take care of the increasing demand." Last year, he said, natural rubber accounted for about 62 per cent of world consumption, but more than 60 per cent out of the rubber used in this country is now synthetic.

Mr. Richardson said world use of rubber would probably rise over the next ten years at an average rate of 5 per cent a year, compounded. At the same time, "under the most optimistic assumption, natural rubber production cannot increase more than 2½ per cent annually through 1965." In our opinion, he said, natural rubber production in 1965 will be less than 50 per cent of the total world demand for rubber. The balance will have to be supplied by man-made rubber.

Mr. Richardson said that about 110,000,000 pneumatic tires would be made in the United States this year. He estimated 1958 production at 116,500,000. If automobile registrations continue to rise at the present rate, he said, the demand for replacement passenger car tires will reach a record total of 70,000,000 in 1965 —about 17,000,000 more than were sold last year.

Producing Natural-Synthetic

Mr. Richardson mentioned that Goodrich was participating in the pilot production of a new synthetic rubber duplicating the molecule of natural rubber. He said that previous man-made rubbers often gave better service than natural rubber in end products, but were still deficient in physical characteristics for truck and aircraft tires. Known as Ameripol SN, the new synthetic is being produced by Goodrich-Gulf Chemicals, Inc., an enterprise owned jointly by the Gulf Oil Corp. and Goodrich.

Goodrich has no producing rubber plantations, but it has completed planting 1,200 acres of rubber trees on a 65,000-acre development area in Liberia, and plans to plant more. The trees will produce in six to seven years.

ELASTOMERS FOR AIR WEAPONS SUBJECT OF MARCH 27-28 CONFERENCE

The Wright Air Development Center of the Air Research and Development Command, U. S. Air Force, in conjunction with the University of Dayton, held a joint conference on "Elastomers for Air Weapons" on March 27 and 28 at the Hotel Miami in Dayton, Ohio. E. R. Bartholomew, chief of the Rubber Products Section of the Organic Materials Branch, Materials Laboratory, Directorate of Research at the Wright Air Development Center, served as chairman of the two-day conference.

Opening remarks at the conference were made by Dr. M. R. Graney, Dean of the College of Engineering at the University of Dayton, while the introduction to the conference was presented by R. T. Schwartz of the Organic Materials Branch, WADC. The first paper presented at the conference was entitled "Elastomers — The Achille's Heel" by Lt. Col. H. C. Hamlin of WADC. Col. Hamlin observed that in the short space of a few years, the environmental temperature range for air weapon systems and their components has expanded from the —65 to +275°F. range through the —130 to +500°F range to —400 to +3000°F.

The speaker outlined some of the problems which currently face development engineers in the application of elastomers to current military situations. The future of rubber as an important engineering material lies in its ability to meet the challenge of present-day requirements.

High-Temperature Aircraft Tires

Dr. L. J. Kitchen of the Firestone Tire & Rubber Co., delivered the next paper at the conference, this one entitled "High Temperature Aircraft Tires." Dr. Kitchen observed that any tire which can be heat-soaked at inflation pressure at temperatures above 325°F. for several hours without bursting can be described as a high-temperature tire. As a long-term research objective, temperatures in the range of 400° to 550°F. have been mentioned as the levels at which future tires must be developed.

He also noted that present aircraft tires are approaching temperature limits above which the use of organic fibers is not practical. It now appears that high temperature aircraft tires will have to be made with metal tire cord. The use of metal cord will require design changes in load limits, which could mean larger tires and larger tire wells in the aircraft.

"Rubber vs. Nuclear Environments" was the title of the paper presented at the conference by John W. Born of the B. F. Goodrich Research Center. Mr. Born's discussion dealt with the effects of radiation on selected dynamic mechanical properties of rubber. To this end, he detailed some of the experiences of the Goodrich Research Center in attempting to determine radiation effects on rubber.

He noted that although radiation tests of individual rubber compounds do not permit a precise prediction on the performance of practical rubber components, they are a first step in that direction. Such tests do give valuable information at least about service performance and life.

"Compounds for High Temperature Fuel Seals and Their Testing Under Simulated Use Conditions" was the title of the paper presented at the conference by E. J. Fujiwara of the Wyandotte Chemicals Corp. This paper dealt with a description of an apparatus used to determine stress-strain data for elastomeric materials at high temperatures while immersed in fuels. Some data obtained using the apparatus for various elastomers was also presented.

Fuel Sealant Compounds

George Gregory of the Products Research Co., for his part in the conference, presented a paper on "Compounds for High Temperature Fuel Sealants." The speaker said that the problem of developing integral fuel tank sealants for use at high temperatures is considerably more complex than that of developing molded rubber parts since application characteristics vitally influence the performance of the product. An integral fuel tank sealant must be applied directly to the structure, must be cured in place, and must form an inseparable bond with the structure. The cured sealant must be capable of withstanding the effect of fuel, shock, and vibration over a wide range of temperatures.

Mr. Gregory offered a comparison of various sealants, detailing their properties and their reactions under certain conditions. He also stressed the point that while it is probable that highly effective fuel tank sealants will soon be perfected, maximum performance can only be achieved through parallel development of fuel tank design.

E. G. Schwarz of the Silicones Division, Union Carbide and Carbon Corp., presented a "Progress Report on Silicone Elastomers" at the conference, focusing his attention upon the areas of controlled reactivity compounds with unique curing systems, conductive compounds, preconditioned stocks, bonding systems, etc. He concluded his discussion with an examination of the future of silicone elastomers.

"Design Criteria for Fluid Sealing" by Robert J. Dunsmoor of the Boeing Airplane Co., discussed attempts being made by the company to correlate elastomeric physical properties with fluid sealing of O-rings and similar type seals. The objectives of the program are better design information for seals, improved functional testing, and physical property guides for polymer research and seal manufacturing.

J. C. Caprino of the Silicone Products Department of the General Electric Co., offered a paper on "Recent Developments in Silicone Rubber for the Aircraft Industry" during the two-day conference. The speaker discussed some recent advances in obtaining silicone rubbers of higher tensile strengths through the use of coated silica fillers. He also discussed silicone sponge materials and coating compounds.

"Silicones and Fluorosilicones" by J. F. Dellaria of the Dow Corning Corp., was another paper featured at the conference. It was the purpose of this paper to provide information on new materials and new developments that serve to meet the critical requirements of the airplane industry, and to review the properties of silicone rubbers.

Francis G. Dean of the Boeing Airplane Co., chose as his topic "Elastomers for Tomorrow's Air Weapons." The speaker declared that elastomers will be as important in tomorrow's air weapons as they are in today's. The same properties of elastomers now utilized will be required. However, these materials must perform their useful functions when exposed to severe environmental influences. Mr. Dean stated that only through greatly expanded research efforts will it be possible to obtain rubber materials with the adequate lead time that will allow the construction of the high performing air weapon of tomorrow.

The "Air Force Polymer Development Program" by Major W. Postelnek of the Polymer Section, WADC, covered the current polymer program and its activities in such fields as the organic polymers, the inorganic and semi-organic polymers, and future considerations. The speaker observed that new polymers must be found which exhibit more horizontal tensile-temperature slopes before truly thermally stable elastomers can be developed.

Dr. J. F. Abere of the Minnesota Mining & Manufacturing Co., spoke on "Fluoro Elastomer Development" at the conference. This paper reviewed the Air Force sponsored fluoro-rubber research which has been conducted at Minnesota Mining since 1947. The research program was shaped by the needs of the Air Force, the properties expected from fluorochemicals, and the raw material supply pattern which was developed at the company.

Teflon Resin Applications

"What is New in the Aircraft Industry Using Teflon Tetrafluoroethylene Resins" by C. F. Carr of the Polychemicals Department, E. I. du Pont de Nemours & Co., Inc., was another of the papers presented at the conference. This paper reviewed the basic properties of Teflon resins together with some of the wide variety of applications which exemplify these properties in the aircraft industry. The author also discussed some recent modifications in fabrication techniques.

J. S. Rugg of the Elastomer Chemicals Department of the DuPont organization, also presented a paper at the meeting, this one on "Viton A—Its Application in the Air Force." He discussed this new fluorine compound which possesses a remarkable combination of mechanical properties, heat resistance, and chemical stability. The properties of Viton A as a raw polymer and its vulcanizers were described.

W. R. Griffin of the Rubber Products Section, WADC, offered a paper on "WADC Evaluation of Experimental Polymers" at the conference. The author noted that a great many polymers have been "put through the wringer" at WADC. Most have been dropped as unsuitable, and a far fewer number have been selected for further development.

NEW GOODRICH-URW CONTRACT ENDS FIFTEEN DAY WALKOUT

A strike called by the United Rubber Workers against the B. F. Goodrich Co. in Akron, Ohio, and eight other cities throughout the nation ended on April 15 with the signing of a new two-year contract. The strike, which began on April 1, had idled 8,000 employees in Akron alone. The new agreement, signed in Cincinnati, Ohio, runs until April 15, 1959 and calls for a number of improvements in working conditions.

The contract calls for a revised and liberalized piecework rate-setting system; a night shift premium pay increase of 3c an hour at the Akron and Clarksville, Tenn., plants; additional vacation time providing for three weeks after eleven years' service and four weeks after twenty-five years; make-up pay for an employee called for two weeks of military service a year.

Also, three days off with pay for a death in the immediate family; company-paid grievance committee time based on a formula that calls for Goodrich to pay two and one-half hours wages a week per 100 workers for union members assigned to process grievances; an "understanding" that when work can be done by a URW member in a plant, the work will not be jobbed out to a contractor who will use workers not members of URW; payment by the company for eye glasses damaged on the job under certain conditions.

Also, elimination of a contract provision that required workers to stand by in the plant without compensation under certain conditions; provision to count time lost and paid for by the union as part of the regular work week, and uniform and improved handling of seniority rights for foremen and other salaried employees.

Piecework Rate System

The piecework rate-setting system had been a big point in the strike. Union officials had argued that old systems did not apply in the use of the new and highly automatic machinery being put in use. The effect, the union contended, was to cut earnings in many cases.

The new system, described by the union as "more equitable" also increases the earnings opportunity on many jobs and increases base rates for many workers, particularly in Akron, a URW spokesman said. Tied in with that provision is a clause that insures a worker will be given a standard operating procedure for performing piecework-rated work.

The night shift premium pay provisions apply in Akron from 6 p.m. to 6 a.m. The agreement adds a half week vacation for 11- to 14-year men, having the effect of starting three-week vacations after 11 years. The fourth week for 25-year men is an added step. Three weeks had been tops before.

Under the new contract a worker called to two weeks of summer military training is paid the difference between his service pay and his regular wages. Wages were not an issue in the strike. The union saves the wage issue for separate negotiations later in the year. The new agreement has a 60-day wage reopening provision. Also, the agreement may be reopened in 1958 for negotiation on pension and insurance plans.

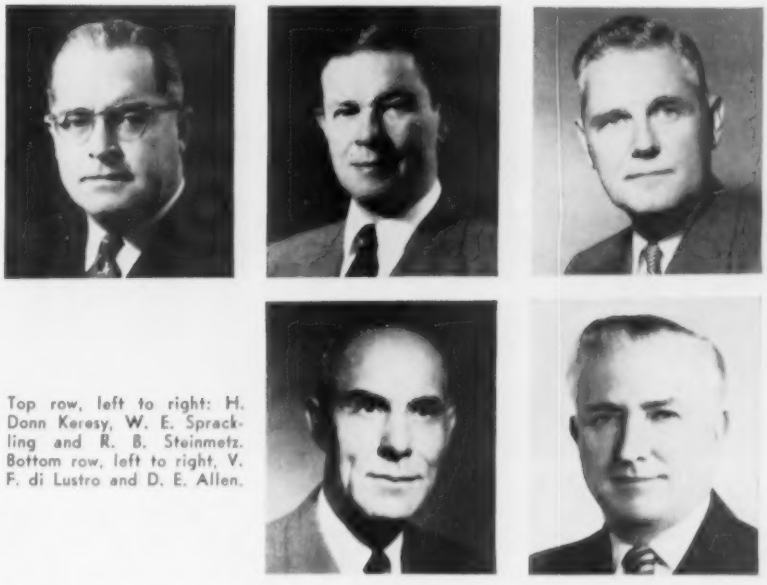
The new agreement won't be in effect until each local union negotiates and signs a supplemental agreement spelling out in detail provisions covered in general in the company-wide contract. As the supplemental is signed, the company-wide agreement becomes effective. The company-wide contract has gone to the union membership for ratification. Certain to be ratified since it carries the recommendation of URW negotiators, the union ordered an immediate end of the strike.

The agreement, union leaders say, is certain to get the required vote of the majority of locals representing the majority of members. Ratification takes the approval of Akron Local 5 and any four other locals. The strike which paralyzed the company cost the 15,000 workers an estimated $2,500,000 in lost wages. In Akron alone an estimated $1,800,000 was lost in wages by the 8,000 strikers.

A number of compromises were agreed on. Several other issues were tossed out. The compromised issues along with what had been agreed on before were wrapped up for the settlement. The talks had started in Cincinnati March 11. The strike call came at midnight, March 31, when the old agreement ran out. Negotiations continued daily without a break.

Covered by the new agreement besides workers in Akron are those in Goodrich plants in Marion, Ohio; Los Angeles; Miami, Okla.; Tuscaloosa, Ala., Oaks, Penna.; Riverside, N. J.; Cadillac, Mich.; and Clarksville, Tenn. D. D. Reichow, director of union relations, headed the company bargaining team. Joseph W. Childs, URW vice-president, and R. C. Murray, union special representative, were chief union spokesmen.

ANACONDA WIRE & CABLE ANNOUNCES ELECTION OF NEW OFFICERS



Top row, left to right: H. Donn Keresy, W. E. Sprackling and R. B. Steinmetz. Bottom row, left to right, V. F. di Lustro and D. E. Allen.

Anaconda Wire & Cable Co., New York, N. Y., has announced the election of William E. Sprackling as president and chief executive officer succeeding H. Donn Keresy, who has been named chairman of the board. Mr. Sprackling formerly held the position of executive vice-president. Richard B. Steinmetz has been elected executive vice-president, succeeding Mr. Sprackling. Vito F. di Lustro has been named vice-president in charge of manufacturing, and David E. Allen has been appointed vice-president, sales. Fritz L. Meeske has been re-elected as a vice-president, while Alvin E. Past has been re-elected secretary-treasurer.

Offers Protective Skin Coating

Milburn Co., Detroit, Mich., has announced the development of a new skin protective coating said to be particularly useful to rubber workers and tire builders. Named "Ply No. 9 Gel," the compound consists of a plastic dispersed in gel form in a water base. When applied to the skin, the water base evaporates to leave a continuous elastic plasticized film. The new compound effectively protects against skin irritation or dermatitis from a wide variety of the chemical and mechanical irritants to which rubber workers are exposed, the company says. Ply No. 9 Gel is non-irritating, non-toxic, non-absorbing and non-drying to the skin and may be freely applied to the arms, neck and face as well as to the hands. Completely water soluble, it is easily washed off with or without soap. A special ingredient in the gel prevents spotting or corroding of finished metals by the worker's perspiration.

Want to make a change in the information submitted for the 1957-58 RUBBER RED BOOK? Write us today!

RHODE ISLAND SPRING MEETING FEATURES SILICONE SEMINAR

The Spring Meeting of the Rhode Island Rubber Club, held on April 4 at the Pawtucket Golf Club, Pawtucket, R. I., featured a seminar on silicone rubber presented by members of the Dow Corning Corp., Midland, Mich. J. R. Harper delivered a paper on "Development and Evaluation of Fluorosilicone and New Silicone Rubbers," while D. C. Youngs spoke on "Techniques of Silastic Fabrication." A third paper, "Silicone Rubber Insulated Wire and Cable," was also presented at the seminar. The after-dinner speaker was Lester F. Shaal, who delivered an illustrated talk on "A Camera in Mexico."

In his address, Mr. Harper noted that silicone rubber has, for some time, been noted for its excellent thermal stability. It has been, and is, performing a wide variety of functions based on this unique property. As with other types of rubber, the use of silicone rubber has been limited by some of its other physical and chemical properties.

Consequently, Mr. Harper declared, a large share of the development work on silicone rubber has been toward the elimination of these limiting factors. Development work during the past year has resulted in two major improvements. One is a major improvement in solvent resistance. The other is a significant improvement in physical properties such as tensile strength and tear strength. Mr. Harper provided detailed information on these new developments along with a comparative evaluation with other silicone rubbers.

Fabricating Silicone Rubber

In his paper on "Techniques of Silastic Fabrication," Mr. Youngs stated that silicone rubber is fabricated very similarly to organic rubbers. Standard rubber equipment and techniques are generally suitable with a few modifications. There are two important differences, however, between silicone rubbers and other rubbers: (1) In the unvulcanized state, organic rubbers are much stronger than silicone rubber; (2) Whereas most organic rubbers have to be milled and processed on warm equipment, Silastic can be milled, extruded and even transfer molded at room temperature.

The speaker went on to say that proper stock preparation is always very important in fabricating silicone rubber. Mr. Youngs touched upon such problems as milling, molding and extruding of silicone rubber, and showed illustrations of various dies used in extruding Silastic.

Mr. Dexter provided an interesting account of the application of silicone rubbers to the insulated wire and cable field, touching upon current developments and the advantages which may be had through the use of this material in this field.

Like to amend the information submitted for the 1957-58 RUBBER RED BOOK? Write us today!

Coming Events in the Rubber Industry

May 24. Connecticut Rubber Group.

June 1. Southern Ohio Rubber Group, Summer Outing, Inland Activities Center, Dayton, Ohio.

June 6. New York Rubber Group, Summer Outing, Doerr's Grove, Milburn, N. J.

June 7. Fort Wayne Rubber & Plastics Group, Summer Outing, Lake Tippecanoe, Leesburg, Ind.

June 7. Quebec Rubber & Plastics Group, Golf Tournament.

June 7-8. Southern Rubber Group, Dinkler Plaza Hotel, Atlanta, Ga.

June 7-9. Los Angeles Rubber Group, Summer Outing, Sahara Hotel, Las Vegas, Nevada.

June 9-13. A.S.M.E., Semi-Annual Meeting, Sheraton-Palace, San Francisco, Calif.

June 11. Buffalo Rubber Group, Summer Outing.

June 14. Boston Rubber Group, Summer Outing, Andover Country Club, Andover, Mass.

June 16-21. A.S.T.M., Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

June 21. Akron Rubber Group, Summer Outing, Firestone Country Club, Akron, Ohio.

June 28. Detroit Rubber & Plastics Group, Western Country Club, Detroit, Mich.

July 26. Chicago Rubber Group, Golf Outing, Medinah Country Club, Medinah, Ill.

Aug. 1. New York Rubber Group, Golf Outing, Baltusrol Golf Club, Springfield, N. J.

Aug. 16. Philadelphia Rubber Group, Golf Outing, Manufacturers' Country Club, Philadelphia, Penna.

Sept. 7. Connecticut Rubber Group.

Sept. 11-13. Division of Rubber Chemistry, A.C.S., Fall Meeting, Hotel Commodore, New York, N. Y.

Sept. 23-25. A.S.M.E., Fall Meeting, Hotel Statler, Hartford, Conn.

Sept. 26. Fort Wayne Rubber & Plastics Group, Van Orman Hotel, Fort Wayne, Ind.

Oct. 1. Los Angeles Rubber Group, Biltmore Hotel, Los Angeles, Calif.

Oct. 4. Detroit Rubber & Plastics Group, Detroit-Leland Hotel, Detroit, Mich.

Oct. 4. New York Rubber Group, Henry Hudson Hotel, New York, N. Y.

Oct. 8. Buffalo Rubber Group, Hotel Westbrook, Buffalo, N. Y.

Oct. 11. Chicago Rubber Group, Furniture Club, Chicago, Ill.

Oct. 18. Boston Rubber Group, Fall Meeting, Somerset Hotel, Boston, Mass.

Oct. 24. Southern Ohio Rubber Group, Fall Technical Meeting, Engineers Club, Dayton, Ohio.

Oct. 25. Akron Rubber Group, Fall Meeting, Sheraton-Mayflower Hotel, Akron, Ohio.

Oct. 25. Philadelphia Rubber Group, Poor Richard Club, Philadelphia, Penna.

Nov. 5. Los Angeles Rubber Group, Biltmore Hotel, Los Angeles, Calif.

Nov. 15. Chicago Rubber Group, Furniture Club, Chicago, Ill.

Nov. 15. Connecticut Rubber Group.

Nov. 15-16. Southern Rubber Group, Memphis, Tenn.

Dec. 1-6. A.S.M.E. Annual Meeting, Hotel Statler, New York, N. Y.

Dec. 3. Buffalo Rubber Group, Xmas Party.

Dec. 5. Fort Wayne Rubber & Plastics Group, Van Orman Hotel, Fort Wayne, Ind.

Dec. 6. Detroit Rubber & Plastics Group, Xmas Party, Sheraton-Cadillac Hotel, Detroit, Mich.

Dec. 13. Boston Rubber Group, Xmas Party, Somerset Hotel, Boston, Mass.

Dec. 13. New York Rubber Group, Henry Hudson Hotel, New York, N. Y.

Dec. 20. Chicago Rubber Group, Xmas Party, Morrison Hotel, Chicago, Ill.

May 14-16, 1958. Division of Rubber Chemistry, A.C.S., Spring Meeting, Netherlands Plaza Hotel, Cincinnati, Ohio.

HULINGS RETIRING AT COPOLYMER; OTHER MANAGEMENT CHANGES SET

A. K. Walton, president of the Copolymer Rubber & Chemical Corp., following the company's annual directors meeting in New York recently, announced several changes in the management of the Baton Rouge, La., plant to become effective June 1, 1957. He also stated that the company would increase its research and development activities—immediately starting construction of a well equipped modern laboratory to house additional personnel and equipment to implement the program.

Courtland M. Hulings, executive vice-president who has served as general manager since Copolymer was first organized, will reach the age of retirement and will relinquish his administrative responsibilities. He will be retained in a consulting capacity and will continue to function in the affairs of the company on special assignments.

Thomas B. Crowell, presently production manager, will become vice-president and general manager of the plant. Mr. Crowell, who is a native of northern New York, received his technical education at Clarkson College of Technology. He worked as production supervisor over a varied number of products for a fourteen-year period with the American Cyanamid Co. before joining Copolymer. Mr. Crowell has been affiliated with Copolymer for the past fourteen years and has worked during that time in various engineering and production supervisory capacities.

Named Administrative Assistant

Irving W. Adams, Jr., will be Mr. Crowell's administrative assistant in charge of the office management, financial, purchasing and sales end of the business. Mr. Adams is a native of Michigan. He received his education at the University of California, Los Angeles, and the Harvard Business School. His business experience was gained with Standard Oil of Ohio, with the Petrol Corp. of Los Angeles, and more recently with Minnesota Mining & Manufacturing Co. in the management of the Los Angeles, Calif. rubber plant of the Reconstruction Finance Corp. Mr. Adams has been associated with Copolymer for the past year and a half in the capacity of assistant to the executive vice-president.

Dr. Paul G. Carpenter has been engaged as director of research and development. Dr. Carpenter is a native of Oregon. He received his education at the Oregon State College and the University of Wisconsin, having obtained his Ph.D. degree at the latter. Before coming to Copolymer, Dr. Carpenter was active in the research programs of the Hercules Powder Co. and, more recently, held a responsible executive position in the Rubber Research Division of the Phillips Petroleum Co.

Dr. J. P. McKenzie will become manager of research. Dr. McKenzie is a native of Alberta, Canada. He is a graduate of the University of Alberta and of Northwestern University. Dr. McKenzie significantly contributed to the development of cold rubber and is one of the country's pioneers in synthetic rubber chemistry. Martin Samuels will become manager of development. He is a native of Ohio and received his education at the University of Dayton. Since graduation he has been in synthetic rubber developments, first with the Dayton Rubber Co. and later with Copolymer.

The position of production manager, left vacant by Mr. Crowell's promotion, will be filled by Charles M. McKay. Mr. McKay is a native of Waverly, La. He was educated at Louisiana Polytechnic Institute and Louisiana State University. His industrial experience was gained through work at sugar mills, at Trojan Powder, Ethyl Corp. and Copolymer. He has been with Copolymer about ten years and has worked in various capacities in production and engineering. Most recently he has been chief engineer in charge of maintenance and construction.

Appointed Chief Engineer

Herbert C. Henry will become chief engineer. He is a native of Monroe, La., and received his education at Louisiana Polytechnic Institute and Louisiana State University. Mr. Henry began his industrial experience as a sugar engineer. He has also worked in the research and development group of Lion Oil. His past experience with Copolymer over a twelve-year period has been as production supervisor and maintenance engineer in both the butadiene plant and the rubber plant.

Donald T. Norwood will become production superintendent over both the butadiene plant and rubber plant. He is a native of Baton Rouge and received his education at Louisiana State University. Mr. Norwood's past experience with Copolymer has been in mechanical design, maintenance supervision and production supervision in both the rubber and butadiene plants.

SOUTH AFRICAN RUBBER INDUSTRY ATTRACTING WELL-KNOWN TECHNOLOGISTS

Indicative of the growth of the rubber industry throughout the world is this group of technical personnel of the South African Bureau of Standards at Pretoria. Shown left to right are M. J. Nix, C. C. van der Merwe and H. T. M. Langshaw. A graduate of the Technological University at Delft, Holland, Mr. Nix is serving as senior technical officer for rubber and plastics at the Bureau. Mr. van der Merwe, holder of a master of science degree from a South African University, is the principal technical officer in charge of Paints, Fuels, Bitumen, Rubber and Plastics in the Division for Chemical Technology at the Bureau. Mr. Langshaw, holder of a bachelor of science degree from an English University, is a senior technical officer for rubber at the Bureau.

Gray Retires From Goodrich

Harold Gray, co-discoverer of non-accelerating age resistors for rubber, has retired after 38 years with the B. F. Goodrich Co. Most recently, he was technical director of the Goodrich Tire Division. Born in southern Illinois, Mr. Gray had planned to be a physician and then switched to chemistry, graduating from the University of Indiana in 1915. He was associated with Eli Lilly & Co., Indianapolis, Ind. from 1916 until he joined Goodrich three years later. His early work was in the field of chemicals which speed up vulcanization of rubber and give better physical characteristics. He also won recognition for contributions to the development of rubber adhesives, particularly in bonding rubber to metal. In 1924, he and an associate discovered the chemical, which when added to rubber compounds gives longer life to rubber products. He was transferred to the Tire Division as compounder in inner tube development in 1927 and was named manager of tire and tube development in 1932. Mr. Gray is a member of the American Ordnance Association, American Chemical Society, American Institute of Chemical Engineers, American Association for the Advancement of Science and the Society of Automotive Engineers.

ONTARIO SECTION HEARS NEILL ON RADIATION IN RUBBER FIELD

About 95 members and guests of the Ontario Rubber Section of the Chemical Institute of Canada attended the April 9th meeting held at the Pickfair Restaurant in Mimico, Ontario. The speaker of the evening was M. T. Neill, sales engineer for Isotope Products, Ltd., Oakville, Ont., who delivered a paper on "Use of Radiation in the Rubber Industry."

In his talk, Mr. Neill observed that the rubber industry has been very active in using radiation as a tool for improved product quality. Betameters, which utilize the radiation absorption qualities of rubber, are now widely used to measure and control square yard weight in calendering and similar applications. Radioactive isotopes, produced either by irradiating the parent material in an atomic reactor or by separation of the fission products of an atomic reaction, give off beta or gamma rays, some of which when passed through a calendered sheet are absorbed or scattered by the sheet. This absorption is primarily dependent on the square yard sheet weight, the speaker said.

Instruments using this principle provide accurate and absolute non-contacting measurement, and automatic control of screwdowns on rubber calenders. The reduction in weight spread due to automatic control by this method can be very significant and result in considerably improved product quality and reduced costs. Economic justification of such instruments is generally possible in tire calender applications within months of the installation.

The rubber industry is also taking a very progressive part in the development of irradiation techniques for vulcanization of rubber. High fields of ionizing radiation can crosslink the rubber molecules and cause vulcanization without the use of chemical additives. Elimination of these additives and their sometimes deleterious effect on the rubber products, can be accomplished by subjecting the uncured rubber to intense gamma radiation.

Although the costs of such irradiation is at present uncompetitive with conventional curing the improvement in some qualities makes radiation curing attractive for some specialized products. Eventually, it may be economic to replace curing chemicals by using irradiation as a catalyst in the heat curing process, Mr. Neill concluded.

Special Polymer Section Opened

Chicago Rawhide Manufacturing Co., Chicago, Ill., has formally opened the new Special Polymer Section of its Sirvene Division. In its announcement, the company indicated this to be a new concept in the manufacture of high quality molded synthetic parts. This new section will manufacture oil seals, diaphragms, packings and other custom molded parts made from the silicones, Kel F elastomer, the fluoro-rubbers and Teflon. The addition has 12,500 square feet, is completely air filtered, temperature controlled and contains a laboratory for research and development as well as control of all its production.

Celebrates 50th Anniversary

Otto Kaufholz

Otto Kaufholz, chief executive of Hermann Berstorff Maschinenbau-Anstalt G. m. b. H. of Hannover, Germany, builders of machinery for the plastics and rubber industry, celebrated the 50th anniversary of his association with the firm in April. Mr. Kaufholz, who is well known in German industry, has made many contributions to the expansion of German trade, particularly in the export market in Europe and the Near and Far East. Original technical and mechanical ideas introduced by Mr. Kaufholz have made him a leader among manufacturers of machinery for the rubber and plastics industries, both in Germany and in other countries. For this reason, he was elected president of the board of the VDMA (Association of German Machine Manufacturers) for lower Saxony. He has helped introduce modern manufacturing methods and helped to rebuild the Berstorff factory so as to ensure ideal working conditions for all employees.

Latex Foam Specs Revised

Rubber Manufacturers Association, Inc., 444 Madison Avenue, New York 22, N. Y., has announced a revision of its "Buyers' Specification — Latex Foam." Dated December 10, 1956, the specification defines terms, describes the product and its manufacture, notes applicable tests, method of tests and test requirements, and offers some valuable information as to allowances, etc. Copies of the specifications are available from RMA.

Rome Cable Acquires T. J. Cope

Rome Cable Corp., Rome, N. Y., has completed negotiations to buy the plant, equipment and other assets of T. J. Cope, Inc., Collegeville, Penna. Terms were not disclosed. T. J. Cope, Inc., formed in 1885, makes cable-pulling devices and tools and equipment used for the installation and maintenance of underground electrical transmission systems.

What's going on abroad? Read "Overseas" by Reuter's. (See page 330).

FORT WAYNE ELECTS OFFICERS: HOLDS SYMPOSIUM ON BUTYL

The Fort Wayne Rubber and Plastics Group held its fourth meeting of the 1956-57 season on April 11 at the Van Orman Hotel in Fort Wayne, Ind., with approximately 190 members and guests in attendance. The meeting featured a panel discussion on butyl rubber and an election of officers for the 1957-58 season.

The panel discussion was presented through the courtesy of the Enjay Co., with four staff members presenting papers on different aspects of the subject. An introduction entitled "General Nature of Butyl Polymers" was offered by Clifford A. Coffey. Robert F. Neu spoke on "Ozone Resistance and Weatherability of Butyl Rubber Compounds," while Charles E. Waggner delivered a paper on "Heat, Aging and Chemical Resistance of Butyl Rubber." The final paper, "Dynamic Properties of Butyl Rubber," was presented by Robert L. Zapp. A complete report on the panel discussion appears, in full elsewhere in this issue.

At the election of officers, the following members were elected to the positions noted: *Chairman*, George Kelsheimer (U. S. Rubber); *Vice-Chairman*, Phil Magner, Jr. (General Tire); *Secretary-Treasurer*, Walter Wilson (R. T. Vanderbilt). The following members were elected directors for a two-year term: Norman Klemp (General Tire), Ed Theall (Dryden Rubber), John Lawless (DuPont), and Robert Hartman (Monsanto). The following members were elected directors for a one-year term: Hoyt Glassford (Sheller Mfg.), H. Cantwell (U.S. Rubber), Stan Choate (Tumpeer Chemical), and Ed Bosworth (Binney & Smith).

Moving to New Laboratories

U. S. Rubber Co., New York, N. Y., has completed the transfer of all personnel and equipment from its old central laboratories at Passaic, N. J. to the company's new research center at Wayne, N. J. Dr. Sidney M. Cadwell, director of research and development, pointed out, however, that installation of much additional new equipment, and many other preparatory operations including landscaping, would have to be completed before the new center would be ready for its scheduled dedication this fall. The new center consists of a central administration building, an experimental laboratory, a chemical engineering laboratory and a greenhouse for growing experimental rubber trees. A staff of approximately 400 will conduct fundamental research in the fields of rubber, plastics, textiles and chemicals.

New Plant for Fuller

H. B. Fuller Co. has moved to a completely new, modern manufacturing plant advantageously located between St. Paul and Minneapolis, Minn. The structure houses offices, new production equipment and modern laboratory testing facilities. Designed to provide better service to the metropolitan and outlying areas, the building is located at 1144 Eustis Street in St. Paul.

AKRON GROUP HOLDS SYMPOSIUM; ELECTS OFFICERS FOR 1957-58

The Spring Meeting of the Akron Rubber Group held on April 5 at the Sheraton-Mayflower Hotel, Akron, Ohio, attracted approximately 400 members and guests. Principal feature of the meeting was a symposium entitled "An Introduction to the Business of Rubber." Panel members included J. T. Cahoon (Firestone), who spoke on "Marketing Research—Methods, Quantity, Price, Consumer Acceptance; W. R. Lantz (Sun Rubber), who spoke on "Purchasing — Policy, Pattern, Specification, Sources of Supply"; M. N. Thomas (Goodyear), who spoke on "Distribution —Production Plan, Inventory, Service, Delivery Cost," and V. L. Oldham (Oldham & Oldham), who spoke on "Patents—Their Value, Patentability, First Inventory, Infringement."

In addition to the panel which was held in the afternoon of April 5, the program included a dinner which was followed by a talk by William Littlewood, vice-president of American Airlines. Mr. Littlewood, past-president of the SAE, discussed "On Wings and Things."

The Akron group has also announced the result of an election of officers for the 1957-58 season of the group. Members elected include: *Chairman,* Harold W. Catt (Goodrich); *Vice-Chairman,* Sheldon Nicol (Goodyear); *Secretary,* Milton Leonard (Columbian Carbon); *Treasurer,* George Popp (Phillips Chemical).

Marketing Research Operations

In his talk on "Marketing Research," Mr. Cahoon described the manner in which the marketing research team operates at Firestone in assisting executives to make decisions. An important function of the market researcher, he stated, is this matter of sales forecasting and the estimation of demand for a given product. Another important function of the market researcher is in the determination of consumer price levels. This involved the training of comparison shoppers. Marketing research, stated Mr. Cahoon, can offer data to check the claim that economic conditions are the primary cause of poor performance. It can usually pin down the particular sales which lagged and isolate the major reasons for the situation.

Mr. Lantz, in his paper on "Purchasing", observed that recent manufacturing cost data prepared from U. S. Department of Commerce reports indicate that over 54 per cent of the value of manufactured goods derives from purchased materials or services. Wisely planned and closely controlled procurement and utilization of materials is essential to the maintenance and oftimes the creation of profit, he declared.

All purchases, he said, large or small, involve in some degree decisions with respect to the following considerations: (1) Selection of one or more than one source; (2) Qualification of each potential supplier; (3) Transportation costs, and (4) Discounts and terms of payment. In outlining purchasing functions, the speaker touched upon such topics as the negotiation of contracts, the "atmosphere of competition", the effect of federal statutes, etc.

In his paper on "Distribution", Mr. Thomas noted that the distribution of goods is a broad subject which reaches from the manufacturing of finished products to the ultimate consumer. It is part of manufacturing when the distribution of raw materials and finished components for the assembly of consumer goods is considered. It is a basic part of marketing and retailing in making goods available for consumer needs.

Factors to be considered in distribution planning encompass such matters as plant location, production planning, inventories, delivered costs, service and delivery time, etc. The utilization of plant capacity must always be considered, he stated.

In consideration of the fact that patent law is a complicated subject, Mr. Oldham, in his paper on "Patents" touched briefly on some phases of the subject, discussing such subjects as what is patentable, the value of patents, information to be gleaned from patents, etc. The speaker also outlined the steps which should be taken in protecting a given development.

Mr. Oldham also discussed the question of "interference", a situation in which two or more patent applications may be currently pending which claim substantially the same patentable subject matter. He also outlined factors involved in patent termination and foreign patents, and commented upon the recent patent infringement action involving the B. F. Goodrich Co. and the U. S. Rubber Co.

Panelists at the Akron Rubber Group Spring Meeting

QM Adopts New Testing Procedure

The Army Quartermaster Corps has announced the adoption of a new testing procedure referred to as mandatory contractor testing. Under mandatory contractor testing, acceptance testing will be performed by the contractor at company facilities, supplier's plant or in commercial laboratories. The contractor will be required to submit certificates of compliance and analysis, including actual test results and the government will periodically check test supplies to assure the validity of contractor's test reports. The procedure has already been applied to certain components of selected shoe items, textiles and textile items and various other items.

Mansfield Tire Promotes Four

Mansfield Tire & Rubber Co., Mansfield, Ohio, has announced four promotions in the Sales and Engineering Departments. Paul C. Taylor, formerly director of engineering, has been appointed factory manager of the company's Oakland plant at Oakland, Calif. Succeeding Mr. Taylor as director of engineering, is Robert M. Kallgren, previously plant engineer. J. D. Barr has been named factory sales manager of the Inland Rubber Corp., a wholly-owned subsidiary, and Roger D. Steinbrey has been named manager of chain store sales of the company's Special Accounts Division. Mr. Taylor, who succeeds the late L. E. Evans, joined Mansfield after previous association with the B. F. Goodrich Co. and the Ohio Rubber Co. Mr. Kallgren was formerly associated with the Armstrong Rubber Co. in Des Moines, Iowa, and Firestone at Akron. Mr. Barr joined Mansfield Tire in 1945 as a timekeeper and later became a general cost accountant and then general accountant for the Inland subsidiary. Mr. Steinbrey became associated with Mansfield Tire in the dealer identification service of the Advertising Department, in July, 1947, immediately after his graduation from Ohio University. He has received several promotions since then.

Wyandotte Plans New Plant

Construction of a large capacity plant for the output of newly developed products has been announced by the Wyandotte Chemicals Corp., Wyandotte, Mich. Frank B. Wolcott, vice-president of the corporation and general manager of the Research and Engineering Division, said the new plant will be known as the oxide products plant. It will be located at Wyandotte, Mich., and will be capable of producing millions of pounds of chemicals annually. He said the new plant, scheduled for completion late this year, will be designed for future expansion. It will be a multi-purpose plant capable of increasing output of Pluronic and Tetronic polyols. These polyethers are widely used nonionic surfactants and only recently were announced as important intermediates in the rapidly expanding polyurethane foam plastics market. Irwin A. Davis of Wyandotte's Engineering and Design Department will be product engineer for the new plant.

BOSTON GROUP SPRING MEETING HEARS HAVENHILL AND DUNKLE

The Spring Meeting of the Boston Rubber Group held at the Somerset Hotel in Boston, Mass., on March 15, featured addresses by Dr. W. L. Dunkle (Enjay) and R. S. Havenhill (St. Joseph Lead). *Some 350 members and guests were in attendance.* Dr. Dunkle spoke on "Butyl Rubber—The Polymer and the Vulcanizate," and Mr. Havenhill addressed the group on the subject, "Electrostatic Potentials in Internal Mixers." Dinner was served following the presentation of the technical portion of the meeting. The after-dinner speaker was Irv Wermont, who spoke on "Psychology in Action—Or the Other Side of the Mind."

In his paper on butyl rubber, which was prepared in conjunction with W. C. Smith and R. L. Zapp, Dr. Dunkle stated that many of the characteristics of butyl rubber vulcanizates may be directly related to the basic properties of the polymer. The manufacture of butyl rubber from isobutylene and isoprene results in polymers of relatively low unsaturation (0.65 to 2.5 mole per cent) and molecular weights ranging from 30,000 Staudinger units to over 50,000 for some experimental materials. Along with this, the tightly packed linear structure of the molecule also contributes to the vulcanizate properties.

Damping Qualities Discussed

The damping qualities of butyl vulcanizates are excellent, Dr. Dunkle said. This is borne out by the large number of shock absorbing articles currently being manufactured from butyl. This good damping property of the cured polymer is directly attributable to the linear nature of the raw elastomer.

Because of the high damping characteristics of the vulcanizate, it is to be expected that the resilience is low. Now, however, butyl rubber may be heat interacted with a promoter such as "Elastopar" in a conventional Banbury cycle with the result that a vulcanizate is obtained which possesses greatly improved resilient properties.

Another property which is basically dependent upon the linear structure of the polymer is the good gas retention of the vulcanizate. The closely packed structure of the butyl molecule hinders the passage of gases. It is well-known that a butyl tube retains air 8 to 10 times longer than tube made of natural rubber. This property is still highly important today in air springs and tubeless tire liners.

The low unsaturation of butyl is responsible for its good ozone, chemical and heat resistance. Because there are relatively few double bonds in the molecule, it is not surprising to find that it exhibits a high degree of resistance to oxidizing media. The good performance of butyl rubber in weatherstrips, tank linings and hot material belts is a direct result of the limited unsaturation in the polymer, the speaker pointed out.

Ebonites cannot be made from butyl because of its low unsaturation. However, it has recently been shown that semi-ebonite type materials can be prepared by covulcanizing butyl with GR-S. This is accomplished by the use of high amounts (10 phr) of sulfur and/or oxidizing agents such as lead dioxide. Thus, materials such as floor tile may be manufactured from butyl rubber, Dr. Dunkle concluded.

Mr. Havenhill, in his paper on "Electrostatic Potentials in Internal Mixers," pointed out that the electrical contact potentials produced during the mixing of rubber compounds in the Banbury mixer are specific for each compounding ingredient and can be used to measure the breakdown of the rubber, the time for incorporation of pigments and oils and the proper sequence and timing of the mixing operations. This can all be done without raising the ram or otherwise disturbing the mixing operations by using the new Electrostatic Contact Potential Recording apparatus which he described.

He also pointed out that by means of the new equipment it should be possible to improve on quality through better dispersion and to reduce costs, through proper sequence and timing of the mixing operations.

United Engineering Promotes Lusk

W. W. Lusk

United Engineering and Foundry Co., Pittsburgh, Penna., has announced the appointment of W. W. Lusk as manager of machinery sales. Mr. Lusk joined the United Engineering organization in 1936. From 1940 to 1945 he served as assistant to the chief engineer of the company. In 1945, Mr. Lusk became a sales engineer, a position he held until his present appointment.

Offers New Neoprene Accelerator

R. T. Vanderbilt Co., New York, N. Y., has added a new accelerator for neoprene G and W types to its line of chemicals for the rubber industry. According to the company, results of extensive laboratory tests and a number of factory trials indicate that this new product, called "Thiate A," is of interest in applications requiring good processing safety and fast curing rates. Samples and technical information are available on request from the suppliers.

GOODRICH REVEALS MAJOR PLANT EXPANSION PROGRAM

B. F. Goodrich Co., Akron, Ohio, has announced that it will spend an estimated $41 million in 1957 in expanding plants, building new ones and in other projects. The capital and investment expenditures will be 10 per cent higher than in 1956, chairman John L. Collyer told stockholders at their annual meeting held in New York City recently. This year's projects are part of a $200 million five-year program launched in 1956.

Stockholders heard from President William S. Richardson and J. Ward Keener, executive vice-president, on the projects that have been recently completed or which are under way. These included a new "off-the-road" tire plant in Miami, Okla.; increased passenger tire capacity in the Los Angeles plant, and an expansion nearing completion at the Avon Lake plant of B. F. Goodrich Chemical Co. for the manufacture of Geon vinyl plastics.

Also, a new chemical plant under construction at Calvert City, Ky.; a new plant just under way at Henry, Ill., for the manufacture of specialty organic chemicals; a Geon vinyl plant just completed at Niagara Falls, Ont.; a new hose plant in Kitchener, Ont., and stepped-up rubber tree planting on the company's rubber acreage in Liberia.

Approve By-Laws Amendment

Stockholders voted to amend the firm's by-laws to eliminate the classification of directors into three classes of three-year terms. This provides for the annual election of directors after the expiration of their present three-year terms. Re-elected for one-year terms were Mr. Collyer, Cleveland E. Dodge, R. S. Rauch and George W. Vaught.

In another action, the by-laws were amended respecting the indemnification of a director, officer or employee against certain litigation expenses.

General Tire Appoints Two

The appointment of William J. Hanlon and Edward J. Serwan to the positions of technical superintendent and production superintendent, respectively, at the Ashtabula, Ohio, chemical plant of the General Tire & Rubber Co. was recently announced. Formerly chief process engineer at Ashtabula, Mr. Hanlon has been associated with the company since 1952. He was previously with the Mathieson Chemical Corp. and the J. T. Baker Chemical Co. He earned his engineering degree at Syracuse University. Mr. Serwan was chief chemist before his assignment as production superintendent. In this latter position, he succeeds J. L. Bailey, who was recently appointed production superintendent at the company's new synthetic rubber plant at Odessa, Texas. Before joining General Tire in 1953, Mr. Serwan was associated with a number of different chemical manufacturing firms as an analytical and research chemist and laboratory supervisor. He received his bachelor of science degree from St. Louis University in 1944.

WASHINGTON HOLDS SYMPOSIUM ON COVERINGS AND COATINGS

The April 17th meeting of the Washington Rubber Group held at the Pepco Auditorium, Washington, D. C., attracted some 50 members and guests who gathered to hear a symposium on "Elastomeric Coverings, Coatings and Linings." Elliott A. Bukzin (Bureau of Ships), chairman of the group, served as moderator for the symposium. Panel members included Harry Berry (Gates Rubber), who spoke on "Rubber Tank Linings"; Dr. G. K. Vogelsang (Gates Engineering), who spoke on "Elastomeric Coatings and Coverings", and Fred W. Weber (Products Research), who spoke on "Thiokol Liquid Polymers and Their Use as Coatings and Sealants."

The April 17th meeting also featured the nomination of officers for the 1957-58 season of the group. The following members were nominated for the offices noted: *President*, D. K. Bonn (U. S. Rubber) and J. L. Gillman; *Vice-President*, R. D. Stiehler (NBS) and P. Mitton (Engineer Research and Development Laboratory); *Secretary*, D. Pratt (Navy Dept.) and A. W. Sloan (Atlantic Research); *Treasurer*, G. W. Flanagan (Goodrich Chemical), J. R. Moore, and C. B. Wheeler (Goodyear).

A motion was passed at the meeting calling for a number of proposed amendments to the constitution. A vote on these amendments was to have been held at the May 15th meeting. The amendments called for a minimum of six meetings a year and for adjustments in the time for the annual meeting and the meeting directly preceding.

Advantages of Factory Linings

In his address, Mr. Berry stressed the advantages of factory over field linings. He discussed one of the most satisfactory and popular methods of arresting tank corrosion by lining all inner surfaces of the vessel with sheets of rubber which are vulcanized in place.

Mr. Berry also outlined such matters as the selection of the proper polymer for a given corrosion problem, and discussed ASME coded vs. non-coded tanks. He also noted those factors which must be decided when translating a specific application into a definite tank and tank lining.

For his part in the symposium, Mr. Weber discussed the development of the new, bichromic curing systems. He stated that $5½ billion is lost annually due to corrosion. The speaker related the manner in which Thiokol liquid polymer sealants are involved in unusual applications and pointed out where they possess material advantages over other coatings and linings.

Thiokol LP sealants, he stated, find use as fuel tank sealants in aircraft; pressurization systems in airplane fuselages; cargo tanks carrying oil, deck caulking compounds, and sealings for expansion joints in concrete construction. He emphasized the ability of the Thiokol compounds to adhere to many different surfaces.

Dr. Vogelsang reviewed the various elastomeric coatings that lend to the preparation of solution coatings. In this regard, he stated that neoprene is best for protective solution coatings because of the inherent balance of properties of the material. He also discussed Hypalon, polyacrylic rubbers, nitrile rubbers, fluoro rubbers, butyl rubber, etc.

Noting that man has been lining various vessels and containers with thick lining materials for decades in order to combat the effects of chemicals, Dr. Vogelsang discussed the same materials applied in the form of coatings from 5 to 30 mils in thickness.

CONVERTIBLE RAIL CAR AND TRUCK TRAILER ANNOUNCED BY C & O

The Chesapeake and Ohio Railway has announced the development of a railway freight car which can be converted into a truck semi-trailer in 30 seconds. Called "Railvan," the unit was developed by C & O to take advantage of the inherent low cost of rail haul and the flexibility of the truck for terminal distribution. Equipped with both rail wheels and highway wheels, the unit utilizes "Torsilastic" springs developed by Goodrich. According to Goodrich engineers, the arms supporting both the highway and rail wheels are attached to the outer casing of the torsilastic spring. This is made up of a rubber tube bonded to an inner, stationery metal tube and a movable outer metal sleeve. Deflection of the rubber provides the necessary elasticity.

The suspension is designed to that the length of the highway and rail arms are easily controlled, assuring the same spring deflection for both highway and rail operation. In addition, the rail wheels can be moved to provide clearance between the rail and the tires. This is done by hinging the highway arm on the spring. The stationary elements of the Torsilastic spring are linked through a splined sleeve and an arm to the actuator screw, which is driven through a gear train by an air motor. Functioning on 90 psi air brake pipe pressure, the air motor twists the spring, transferring the Railvan wheels from railway to highway position or vice versa in about 30 seconds. The photograph above shows the highway wheels in position with the rail wheels in the raised position.

Wabash Rubber Expanding

According to a recent announcement, an additional 45,000 square feet of production and warehouse space will be added to the existing 15,000 square foot plant at Seymour, Ind., by the Wabash Rubber and Plastics Corp. The ground has already been broken and building started. The new addition will increase production, which is now in excess of $1,000,000, by more than 100 per cent. Additional machinery will be installed and it is expected that 200 workers will be employed before the end of the year. The parent company, the H. O. Canfield Co. of Bridgeport, Conn., has been in operation since 1888.

Tumb-L-Matic To Move

Tumb-L-Matic, Inc., suppliers of tumbling equipment and processes, has announced that its plant and executive offices will be located, starting June 15, at St. Mary's Street, Stamford, Conn. The move is expected to permit a 30 per cent increase in production through the acquisition of new equipment, expanded laboratory facilities and efficient space layout. Originally formed ten years ago at 4510 Bullard Street, New York, N. Y., its present address, Tumb-L-Matic has been a pioneer in the field of dry tumbling and presently specializes in both wet and dry tumble finishes for rubber, plastic, metal and wooden articles. The new quarters, located in the Shippan Point area of Stamford, are handy to the railroad, the Boston Post Road and the New England Thruway, now under construction. Tumb-L-Matic officials expect the location and the modern plant features will greatly facilitate improved service to customers and speed of delivery. The move will be carried out without disruption of scheduled production. The working personnel of Tumb-L-Matic will continue almost without a change.

INTERNATIONAL SYNTHETIC RUBBER SYMPOSIUM HELD ON MARCH 26-28

Approximately 680 persons were registered at the International Symposium on Synthetic Rubber which was held at Church House, Westminster, London, S.W.1, England, on March 26 through 28, sponsored by *Rubber and Plastics Age (London)*, the symposium attracted 24 participants from the United States, 5 from Canada, 7 from France, 1 from Belgium, 12 from the Netherlands, 17 from Germany, 1 from Norway, 11 from Italy, 1 from Ceylon, 4 from Czechoslovakia and 5 from the Soviet Union.

G. E. Beharrell, chairman of the International Synthetic Rubber Co. and vice-chairman and managing director of the Dunlop Rubber Co., Ltd., served as chairman of the symposium. The Rt. Hon. Sir David Eccles, president of the Board of Trade, served as honorary president.

A full program of papers was presented on each day of the three-day meeting. A symposium dinner, held in the evening of March 28 at the Waldorf Hotel in London, concluded the symposium program. Abstracts of the papers which were presented at the symposium follow herewith:

German Synthetic Rubber Developments. ***Paul Baumann (Chemische Werke Hüls AG).*** In Western Germany a new synthetic rubber plant will be erected. Butadiene will be produced from n-butane and styrene will be delivered from Chemische Werke Hüls AG. The dehydrogenation of n-butane to butadiene will be made by the Houdry Process. The dilute butadiene obtained by this process will be concentrated by the copper ammonia acetate extraction process of the Esso Research and Engineering Co. In total, 38,000 tons per year of butadiene will be manufactured; 6,000 tons will be available for other tasks. The butadiene concentration capacity will be such as to include purification of all the recycle butadiene from polymerization.

Polymerization will be carried through in 5,300 gallon agitators using a "Redox" system for the catalysis. The polymerization plant will be subdivided in two polymerization batteries with subsequent coagulating and drying equipment. The plant will manufacture 45,000 tons per year of Buna Hüls K, i.e., cold rubber which is a butadiene styrene-copolymer produced at 41°F. with "Redox" system and moderators.

"Ameripol" SN Rubber. ***Staff, B. F. Goodrich Research Center for Goodrich-Gulf Chemicals Inc. (Presented by R. P. Kenney, B. F. Goodrich Co.).*** "Ameripol" SN is a cis-1,4-polyisoprene, produced by the polymerization of isoprene by a Ziegler-type catalyst. The identity of "Ameripol" SN with Hevea rubber hydrocarbon has been established by infra-red absorption, phase microscopy, second order transition measurements and X-ray diffraction. Molecular weight and structure have been studied by osmotic pressure and solution viscosity methods.

Compounding has indicated a close relationship between "Ameripol" SN and Hevea rubber with some differences stemming possibly from the non-hydrocarbon matter in the latter. These differences are not sufficiently large to indicate any difficulty in making a direct substitution of one for the other in practically any application. Two groups of 11 by 20 heavy-duty bus and truck tires have been made and tested. To date, more than 2 million miles of road testing has been run without a failure. These tires are still in service. It can be concluded that "Ameripol" SN is a potential replacement for all or part of the natural rubber in heavy-duty tires.

British Developments in Synthetic Rubber. ***E. A. Murphy (Dunlop Rubber Co., Ltd.).*** The early history of synthetic rubber in Britain was traced as associated with the names of Tilden, Perkin, Matthews and Strange, relating how in 1914 a butadiene rubber was produced using a sodium polymerization process. Between 1930 and 1939, the Dunlop Laboratories carried out research on polysulfide rubbers, while I.C.I. worked on butadiene and chloroprene polymers and copolymers. In 1940 a reduction/activation process for vinyl polymerization was developed.

A new route for the manufacture of butadiene was devised and in 1942 Dunlop commenced work on butadiene polymers. At Fort Dunlop, over 700 tons of polysulfide rubber were produced during the war. Further experiments on butadiene polymers were carried out, including pilot plant production of cold rubber in 1952. The present production of synthetic rubber in Britain was outlined, and reference was made to new methods of producing synthetic rubbers.

Basic Italian Research on New Synthetic Elastomers. ***Giulio Natta (Instituto di Chimica Industriale del Politecnico di Milano).*** Through the use of new polymerization processes, based on the use of catalysts containing transition metals, linear polymers have been prepared from various types of unsaturated hydrocarbons. These polymers have very high molecular weight, are practically free of branching, and possess a chemical structure which is more regular than for conventional polymers. Using catalytic processes of different stereospecificity, new and unforeseen classes of plastic and elastomeric materials have been obtained. By polymerization of diolefines, various stereoisomeric polymers were obtained, some of which were not previously known. In the case of polybutadiene, besides both the trans and cis stereoisomers with 1,4-enchainment both in the crystalline state, also the two crystalline, isotactic and syndiotactic, and the amorphous, atactic, stereoisomers with 1,2-enchainment were obtained. The lattice structure of the four crystalline stereoisomers of polybutadiene has been determined.

In the field of alpha-olefine polymers, the atactic linear products of very high molecular weight present improved elastic properties in respect of the previously known olefine polymers. Partially isotactic (20-25% crystalline) polymers of the alpha-olefines, consisting of stereoblocks, show in the oriented state elastic properties (reversible elongation of 100-200%) and a high tensile strength, as a consequence of a chain aggregation (acting as a physical thermolabile vulcanization) connected with the crystallinity. Ethylene-alphaolefine homogeneous polymers have been prepared which show very high resilience. From such saturated copolymers, vulcanized rubbers were obtained having tensile strengths up to 3 Kg./mm.^{2}, elastic elongation higher than 500%, good resilience and very good chemical and abrasion resistance. Also copolymers of alpha-olefines with small amounts of diolefines were prepared which may be cured by conventional methods. The low-temperature elastic properties of the new products are related with mobility of the chains, transition temperature, molecular weight and crystallinity.

Oil-Resistant Compositions from Nitrile and Acrylic Rubbers. ***S. Mottram and P. H. Starmer (British Geon, Ltd.).*** Special purpose synthetic rubbers have been developed for use where natural rubber and general-purpose synthetic rubbers would be unsuitable. A particular example is in application requiring good resistance to oils. This paper discusses the oil resistance of nitrile and acrylic rubbers and indicates that this is dependent on the chemical nature of the raw polymer. Since improvement in oil resistance is often obtained only at the expense of a reduction in some other property, such as low temperature flexibility, different polymers are produced to meet different service conditions.

Properties other than oil resistance may be modified or enhanced by the incorporation of various compounding ingredients; e.g., fillers, particularly carbon black, improve the tensile properties while plasticizers improve the flexibility at low temperatures. Blends with other rubbers and also with plastics give materials with useful properties.

Self-Reinforced Elastomers. ***E. E. Gale, H. A. Pfisterer and E. B. Storey (Polymer Corp.).*** The self-reinforced elastomers are recognized as a special class of rubbers which are characterized by a unique balance of modulus, hardness and tensile strength. The chemical, physical and rheological properties of these rubbers are discussed in some detail and recent improvements, particularly in handling and mixing characteristics, are described. Compounding variables are thoroughly reviewed with particular reference to the type and quantity of fillers and plasticizers used. The advantages of the self-reinforced elastomers in shoe soling and floor tile were discussed, together with a comprehensive survey of other applications.

Effect of cis-trans Ratio on the Physical Properties of 1,4-Polybutadienes. ***Gerard Kraus, J. N. Short, and Vernon Thornton (Phillips Petroleum Co.).*** The physical properties of vulcanized 1,4-polybutadienes, prepared by heterogeneous catalysis and ranging from 95 per cent *cis* to nearly 100 per cent *trans* configuration, were investigated in gum

and tread formulations. Vulcanizates of all 1,4-polybutadienes exceeding 15 per cent in *cis* content are completely rubbery at ordinary temperatures. Polybutadiene of 93 per cent *trans* content yields tough, leathery, crystalline vulcanizates at 80°F., which become rubbery at moderately elevated temperatures.

Without exception the important physical properties change little between 25 and 80 per cent *cis* content. At both ends of this range the tensile strength of both gum and black stocks rises as a consequence of increasing chain regularity. However, in gum tensile strength not even the highest *cis*-polybutadienes are equivalent to natural or synthetic *cis*-polyisoprenes. Black stocks of very good tensile strength with elongations ranging from 500 to 700 per cent are obtained with both *cis*- and *trans*-polybutadienes.

The *cis*-polybutadienes have excellent resilience and low hysteresis and maintain their resilience to temperatures as low as —40°F. The tendency to crystallize rapidly at low temperatures disappears between 87 and 82 per cent *cis* content so that polymers of moderately high *cis* unsaturation have exceptional low-temperature characteristics. These polymers remain completely rubbery down to their brittle point (ca. —85°C.).

The excellent resilience of *cis*-polybutadiene is particularly apparent in carbon black-reinforced stocks. Because of the inherently low modulus of these stocks and their low sulfur requirement, these may be vulcanized to rather high degrees of cross-linking. This results in further improvements in resilience and heat build-up with only moderate sacrifices in tensile strength and ultimate elongation.

Vulcanizates of 70 to 80 per cent *trans*-polybutadienes exhibit evidence of crystallinity over a wide range of temperatures and are probably not completely melted at room temperature. Although their resilience is less than that of the high *cis*-polybutadienes, it is still somewhat better than that of GR-S, particularly at low temperatures. The 1,4-polybutadienes are more resistant to oxidative scission than emulsion polybutadiene or GR-S and are greatly superior to natural rubber in this respect. The dominant effect in the aging of 1,4-polybutadiene is cross-linking. Because of their low sulfur requirements, the *cis*-polybutadienes offer a particular advantage in aging resistance.

Further Developments in the Field of "Vulkollan" Polyurethane Rubber. ***Erwin Muller (Farbenfabriken Bayer AG).*** As an introduction, the various types of polymerization of linear addition products containing isocyanate groups were discussed. Generally, polymerization by water, poly-alcohols and diamines is dealt with. Special attention is given to the polymerization with poly-alcohols, especially with glycol and diamines. For the two names polymerization mechanisms it appears to be characteristic that, in order to achieve technically valuable properties for every di-isocyanate the suitable glycol or diamine must be found. New combination possibilities between di-isocyanates on the one hand and polymerization agents on the other hand (glycol or diamine) were mentioned. Finally, processes for the production of storage-stable "Vulkollan" types and their polymerization were dealt with.

Silicone Rubber Hearts

The development of a small substitute glass and rubber heart or other substitute internal organs has been cited as a future possibility by Dr. Peter F. Salisbury of Cedars of Lebanon Hospital, Los Angeles, Calif. Dr. Salisbury stated recently that research on such projects is beginning, and that general principles make them look feasible. One possible design for a substitute heart is a double pump, each unit a U-shaped tube made of silicone rubber. Working on a hydraulic pressure principle, blood would be squeezed through tubes, wide at the opening and growing progressively smaller. They would be enclosed inside glass or plastic chambers. Pumping action would come from forcing a liquid into and out of this chamber to press, pulselike, on the tubes. A tube would have to protrude through the chest wall to supply the pumping fluid. Dr. Salisbury believes that electrical energy would have to be used to activate the unit.

Silicone Rubber — Its Growth and Recent Developments. ***Philip C. Servais (Dow Corning Corp.) and I. H. Riley (Midland Silicones, Ltd.).*** At first, the only silicone rubber available was based on pure polymers of dimethylsiloxane. Subsequently, silicone rubbers appeared based on copolymers. Phenyl groups were introduced, making silicone rubber that is flexible at temperatures as low as —165°F., vinyl groups were introduced for both sulfur-type vulcanization and controlled peroxide vulcanization and, finally, fluorine-containing silicone rubbers for use in contact with aromatic solvents and jet fuels. The first step toward high strength silicone rubber was made by the use of reinforcing silica fillers. Continuing research effort in the field of polymer-filler interaction promises silicone rubbers of even higher strengths. Resistance to compression set at elevated temperatures was improved by the use of heavy metal additives and later by vinyl-containing polymers. Heat stability was enhanced by special compounding to produce silicone rubber capable of withstanding 600°F. for a limited time.

Vulcanization is normally done with organic peroxides and heat. As a result of study on new systems, vulcanization is now possible by the reaction of vinyl groups with sulfur, by the use of metal catalysts at room temperature and by irradiation. Processing has progressed to the point where extruded or calendered silicone rubber can be vulcanized in a matter of seconds at 650°F. The usual continuous steam vulcanizers have been used successfully. Silicone rubbers' retention of rubbery properties over a wide temperature range has simplified design, improved performance, increased life and reduced maintenance of rubber parts. Applications have been found in the medical, pharmaceutical, aircraft, automotive, chemical, power, home appliance, transportation and shipbuilding industries.

Organic Fluorine Rubbers. ***J. C. Tatlow, (University of Birmingham).*** No abstract available.

The Neoprene Latices. ***E. P. Hartsfield (E. I. du Pont de Nemours & Co.).*** Neoprene latices, like natural rubber latices, are stabilized colloids in which the dispersed phase is the elastomer. In view of this fact, it is readily apparent that the neoprene latices can be easily employed in all those processes which normally use natural rubber latex. Minor variations in processing techniques between the two latices are generally due to differences in the emulsifying agents present in the two systems. Sufficient information is given in this discussion to enable the user of neoprene latex to apply this product to his normal processes.

The majority of products made from neoprene latex, in common with those made from natural rubber latex, require vulcanization in order to develop their major properties. Therefore, it is necessary to use compounding ingredients in latex formulations. The extensive use of neoprene latex in such products as bonded fibers, foams, adhesives and dipped goods is dependent upon the resistance of neoprene to a wide variety of deteriorating influences. The relationship between these deteriorating influences and the specific applications are discussed in some detail. A new type of neoprene latex —Type 750—which possesses outstanding stability to storage, mechanical action and compounding, is described. This new latex produces films which are characterized by low modulus, improved hot properties and marked resistance to stiffening due to crystallization. Freshly-prepared films from this latex also have high wet gel strength and extensibility.

Relationship of Polymer Structure to the Properties of Butyl Rubber Vulcanizates. ***W. L. Dunkel, W. C. Smith and R. L. Zapp (Enjay Laboratories).*** Many of the unique and interesting properties of butyl rubber vulcanizates are dependent in a large part on the basic chemical structure of the butyl polymer. Grades of butyl rubber are available which vary in unsaturation levels from 0.5 to 2.5 mole per cent. The different butyl polymers also vary in molecular weight: from 30,000 for some grades of the elastomer, to over 50,000 Staudinger units for other grades. The linear nature of a butyl chain with its regularly spaced methyl side groups is still another distinguishing characteristic of the polymer. These factors tend to contribute to butyl vulcanizates exhibiting excellent ozone, chemical and heat resistance, high impermeability to gases, and good damping qualities.

A technique has been developed which can be utilized in compounding butyl to obtain vulcanizates exhibiting increased resilience and improved dynamic properties. This consists of either thermal or chemical interaction of the polymer with carbon black. The co-vulcanization of butyl with Buna-S and natural rubber has now been achieved to yield semi-ebonite compounds. Based on these new techniques plus other sound compounding practices, butyl vulcanizates can be varied to yield many different and useful materials. Because of the latitude in compounding techniques and variables which can be employed, its usefulness in applications other than inner tubes is increasing rapidly. Electrical goods, automotive parts and proofed goods are just a few fields into which butyl is now expanding.

The Status of Butyl Tires in the United States. *D. J. Buckley (Esso Research and Engineering Co.).* Tires of high quality can be produced from butyl polymers which impart their inherent qualities of resistance to aging, ozone and flex cracking, tearing and abrasion. In addition, butyl passenger tires have demonstrated other qualities directly related to critical areas of tire performance such as improved riding comfort and traction and braking on virtually all surfaces; reduced noise level, and freedom from tread groove and sidewall cracking. A number of problems demanded solution before a successful butyl tire could be realized. The matter of resilience required extensive research in the field of polymer-pigment habit. A chemically-promoted heat treatment of polymer-pigment systems represents the solution to this problem.

Butyl latices have been developed and found applicable to cord treatments for both rayon and nylon. One of these latices designated as ENJ-B-12 is available in pilot-plant quantities. The rate of vulcanization of butyl polymers is slower than other tire polymers such as GR-S and natural rubber. Research in this direction has produced accelerated systems showing significant increases in rate of vulcanization of butyl compounds. Moreover, the development of a new butyl polymer, ENJ-B-11, opens up areas of compounds capable of rapid vulcanization. ENJ-B-11 vulcanizates represent new levels of excellence in flexing behavior. Commercially acceptable techniques for the production of butyl tires have been developed. The possibility of combining the properties of butyl polymers with existing tire structures made of GR-S or natural rubber has attracted much attention. Adhesive systems capable of generating strong bonds between these rubbers are now available.

Butadiene/Vinyl Pyridine Copolymers. *W. Gumlich (Chemische Werke Hüls AG).* An important prerequisite for the successful introduction of a new copolymer will be the discovery of special fields of application apart from a good availability of its basic monomer components. Both these conditions apply to a butadiene/vinyl pyridine copolymer as it was first developed by the author approximately twenty years ago. Among the different possible vinyl pyridine compounds the α-methyl-β'-vinyl pyridine grade is obtained at Hüls from aldehyde collidine by application of a method comparable to the production of styrene from ethyl benzene, after it had become possible by the selection of suitable catalysts to avoid a splitting up of the pyridine ring by hydrogenation which would invariably occur when using the catalysts customarily applied in styrene production.

On a pilot-plant scale a copolymer of this vinyl pyridine grade with butadiene and styrene will soon become commercially available under the trade name of "Bunatex" Vp. This product will be specifically used in the impregnation of textile goods to improve their adhesion to rubber. This will be a quite extensive field of application when contemplating its use for the manufacture of tire goods, driving and conveyor belts, and similar articles. Reference was made to the special advantages obtained in the use of cold rubber formulations for butadiene/styrene/vinyl pyridine copolymers. Furthermore, it was pointed out that a considerable degree of oil resistance may be achieved by the quaternization of such polymers which may be free from acrylonitrile.

A New Family of Elastomers. *R. M. Pierson, W. E. Gibbs, G. E. Meyer, F. J. Naples, W. M. Saltman, R. W. Shrock, L. W. Tewksbury and G. S. Trick (Goodyear Tire & Rubber Co.).* A versatile family of elastomers has been prepared by free radical addition of aliphatic mercaptans to the double bonds of diene polymers. High saturation levels were readily achieved without degradation of the basic polymer chain. The technology and kinetics are similar to ordinary emulsion polymerization.

By varying the nature of the base polymer, the mercaptan used, and the extent of saturation, a wide range of compositions and of physical properties were attained in the adducts. In general, resistance to aging, ozone attack, heat, solvent swelling, and to permeation by gases increased with increasing extent of saturation. Outstanding performance in these qualities was achieved by adducts of polymers whose double bonds had been over 90 per cent saturated. A highly saturated methyl mercaptan adduct of polybutadiene showed (a) stress-strain and air aging properties at 400°F. better than commercially available ethylacrylate copolymers and various semi-commercial heat-resistant elastomers; (b) diffusion resistance better than butyl; (c) solvent swell intermediate between neoprene and medium nitrile content butadiene-acrylonitrile rubbers, with Tg below —30°C.; (d) ozone resistance comparable to the better commercially available saturated rubbers. Increased solvent resistance was obtained by preparing adducts of the appropriate butadiene/acrylonitrile copolymers.

"What kind of a tree did you make this spear from anyhow?"

Adducts with saturation levels up to about 85 per cent could be cured by the same procedures used for the base polymers. Activated or "butyl type" curing systems were required for higher saturation levels. The relative rates at which aliphatic mercaptans add to the several types of double bonds present in emulsion diene polymers were examined in a preliminary way.

Auxiliary Materials for Synthetic Rubber. *W. McG. Morgan (Monsanto Chemicals Ltd.).* The role of organic auxiliary materials was reviewed against the background of changing end-use requirements, polymer and other raw material availability, and processing conditions. Compounding and vulcanization of butadiene-type synthetic rubbers have followed lines broadly similar to those for natural rubber. Differences in emphasis on sulfur/accelerator ratio and accelerator types are indicated, with particular reference to the growing use of accelerators of the sulfenamide class.

Butyl presents a special problem, as it vulcanizes less readily and the elastic properties at normal temperatures are inferior. Advances in both vulcanization and compounding techniques, in particular the polymer/carbon black relationship, increase the possibility of developing wider use of this polymer. The ability of a rubber product to withstand deterioration under natural or artificial conditions depends on correct selection of polymer type, compounding ingredients, vulcanization conditions and specific organic age registers. Greater understanding of the interaction of these factors and of aging processes, and the development of new "anti-weather" antioxidants, is leading to improvements in service life of rubber products made from synthetics.

Carbon black remains as yet a unique reinforcing filler. The development of high-styrene rubber reinforcing resins, however, has opened the way to the development of hard-wearing, low-gravity, light-colored stocks, which are finding increasing use, especially in place of leather.

Yale & Towne Manufacturing Co., Philadelphia, Penna., has published a bulletin describing the features of its quadruple lift attachment for extra high stacking with industrial lift trucks.

TALK BY SVETLIK FEATURES PHILADELPHIA GROUP MEETING

The April 12th meeting of the Philadelphia Rubber Group, held at the Poor Richard Club in Philadelphia, Penna., was addressed by J. F. Svetlik, manager of technical service for the Phillips Chemical Co. Mr. Svetlik spoke on "The Production, Special Features and Applications of Butadiene-Styrene Copolymers." The meeting was attended by approximately 170 members and guests.

It was announced at the meeting that the summer golf outing will be held at the Manufacturers' Country Club, Oreland, Penna., on August 16. R. A. Garrett (Armstrong Cork), will serve as general chairman of the Outing Committee and he will be assisted by T. W. Elkin (R. T. Vanderbilt), A. L. Shaw (Goodrich), T. N. Loser (Wyrough and Loser), R. B. Carroll (R. E. Carroll), and V. H. Perrine (Thiokol Chemical).

Cash draw prizes were presented at the April 12 meeting to W. H. Hannaway (Lee Rubber), H. E. Selby (C. P. Hall), and R. A. Stengard (DuPont). The meeting was attended by Dr. B. S. Garvey (Sharples Chemicals), chairman of the Division of Rubber Chemistry, A.C.S., and by John M. Ball (Midwest Rubber Reclaiming), past-chairman of the Rubber Division, was also in attendance.

Speaks On GR-S Type Rubbers

Mr. Svetlik, in presenting his talk on the GR-S type rubbers, first observed that synthetic rubber was first made as early as 1880 and patents on processes to produce rubber polybutadienes were issued in Germany in 1912. In continuing his paper, Mr. Svetlik outlined the basic properties of the butadiene-styrene copolymers, touching upon compounding ingredients, processing, etc.

The speaker also outlined the final products of the copolymer plants, mentioning unpigmented rubbers, carbon black masterbatches, oil masterbatches and oil-black masterbatches. Mr. Svetlik also spoke of the positive attributes of synthetic rubber in comparing them with the natural product, citing such factors as thermal conductivity, etc. He also discussed the new natural-like synthetic polymers and stated that with continuing research scientists will continue to develop improved elastomers.

Buys Swim Accessories Business

Auburn Rubber Co., Inc., Auburn, Ind., has announced the acquisition of the business of Superior Fabricators, Inc. of Chicago, Ill. Superior Fabricators, Inc., are manufacturers of a popular priced line of swim accessory products, consisting of snorkels, swim fins and masks, ear drum protectors, nose clips and hand swim paddles.

Dill Manufacturing Co., 700 E. 82nd St., Cleveland 3, Ohio, has released a catalog sheet detailing the company's complete line of tubeless tire valves for all 1957 cars.

Michigan Alkali Names Hall

George E. Hall, Jr.

George E. Hall, Jr., has been named technical advisor, pigment sales, for the Michigan Alkali Division of Wyandotte Chemicals Corp. Mr. Hall brings seventeen years of chemical research experience to his new post. During that time, he worked on the development of new pigments for use by rubber, paper, plastics, paint and printing ink industries. Since joining Wyandotte in 1951, Mr. Hall has concentrated on applications of Purecal in paper coating, board coating and paper filling, most recently in the capacity of supervisor of inorganic research. A graduate of Clark University, Mr. Hall holds an M. A. degree from Boston University and is a member of the American Chemical Society, the Rubber and Inorganic Divisions of ACS, and the Technical Association of the Pulp and Paper Industry. Dr. Clyde Leaf succeeds Mr. Hall as supervisor of inorganic research.

Davis Wins Order For Release

Poncet Davis, Akron industrialist convicted of income tax fraud in January, 1954, has been ordered released from the Springfield, Mo., federal prison after serving 10 months. Released on $25,000 bond, Mr. Davis was freed by the U. S. Sixth Circuit Court of Appeals in Cincinnati, Ohio, pending the outcome of his appeal from the conviction. His lawyers appealed the case on the ground that Mr. Davis, former president of the Robbins Tire & Rubber Co., Tuscumbia, Ala., should have been sentenced under a 1939 act which makes the filing of false income tax returns a misdemeanor. Mr. Davis, they argued, was sent to prison for violating a stiffer amendment to this law, which makes the practice a felony. If the contention is upheld, no more than a year's sentence is possible.

NRM Elects Two New Officers

Two new officers were elected by the board of directors of the National Rubber Machinery Co. at the annual meeting held on April 24 in Akron, Ohio. The new officers are E. E. Heston and Halbert Frank, both of whom were elected assistant vice-president. All other company officers were re-elected at the meeting.

JETER AND STEVENS ELECTED GOODRICH VICE-PRESIDENTS

B. F. Goodrich, Akron, Ohio, has announced the election of R. G. Jeter and E. A. Stevens as vice-presidents. Mr. Jeter is a graduate of the University of Akron and received his law degree at Ohio State University. He began his association with Goodrich by working in the plant during summer vacations. On November 1, 1948, Mr. Jeter was named general counsel by the company. At that time he was a member of the law firm of Slabaugh, Guinther, Jeter and Pflueger. He has also served as counsel for the Ohio Edison Co., the Akron Transportation Co. and the Erie Railroad. In his new post, Mr. Jeter becomes vice-president, general counsel and secretary of the firm.

Mr. Stevens, who has been elected a vice-president and treasurer of the company, has spent much of his time overseas. He joined Goodrich in 1928, after he was graduated from the Yale University Sheffield Scientific School with a degree of Bachelor of Science in chemical engineering. He was first assigned to the firm's Processing Division, where he served in the general chemical laboratories, and in 1929 he became a member of the Raw Materials Department. The following year, he entered the Purchasing Division as a crude rubber buyer and in 1933 he joined the Far East staff, returning to Akron in 1936. In 1940, he became managing director of purchases. Mr. Stevens was named director of purchases in 1947 and in 1952 he was named treasurer of the company.

Other Officers Re-elected

In addition to Mr. Jeter and Mr. Stevens, the following officers were re-elected: John L. Collyer, chairman of the board; W. S. Richardson, president; J. W. Keener, executive vice-president; Arthur Kelly, executive vice-president; F. K. Schoenfeld, vice-president, research; J. A. Hoban, vice-president, marketing; and H. V. Gaertner, controller.

Naugatuck Promotes Two

Dr. Paul M. Elliott has been appointed coordinator of Kralastic molding compound production at the Baton Rouge, La., plant of the Naugatuck Chemical Division, U. S. Rubber Co. Dr. Elliott, formerly manager of Kralastic development for Naugatuck Chemical, will be succeeded in the development post by Robert L. Knapp. Dr. Elliott, who obtained his doctorate degree in chemistry from Cornell University, joined the general laboratories of the rubber company as a research chemist in 1937. He transferred to Naugatuck Chemical in the same post two years later. After heading several research teams in plastics development, he was appointed Kralastic development manager in 1953. Mr. Knapp, a graduate of Brown University, joined Naugatuck Chemical as a junior research chemist in 1946. He became a senior research chemist in 1951, and leader of a research team the following year. In his new post he will be stationed in Naugatuck Conn.

Names in the News

Dr. Desmond M. C. Reilly, formerly responsible for technical and promotional literature for the Westvaco Mineral Products and Westvaco Chlor-Alkali Divisions of Food Machinery and Chemical Corp., has been named manager of technical information for the company's recently formed Organic Chemicals Division.

W. John Porter, Jr., engineer for the Hamilton Division of Baldwin-Lima-Hamilton Corp., has been assigned to the company's New York district sales office where he will direct sales of mechanical, hydraulic and compacting presses.

Richard W. Elder, associated with National-Standard Co. since 1933, has been appointed general sales coordinator for the company and will also continue as manager of round wire and specialty sales.

Albert M. Dexter, formerly manager of gage research for Pratt & Whitney Co., Inc., has been named assistant to the manager of the company's Gage Division and Arthur H. Wolfson has been appointed manager of gage research.

M. M. Suba, previously technical representative for the Extrusion Materials Division at the Hartford office of the Bakelite Co., has been appionted manager of the Division.

Alden H. Davis, of Columbian Carbon Co., has been appointed resident technical service manager in Sao Paulo, Brazil for Companhia Petroquimica Brasileira-Copebras, which was formed as a joint enterprise of the Columbian Carbon Co.

L. D. Burnett, Jr., formerly associated with the Flexible Packaging Division, has been appointed assistant manager of the Film and Sheeting Division of Bakelite Co.

Martin P. Kerins, formerly supervisor of product managers, has been appointed sales manager of industrial national accounts for the Stauffer Chemical Co. with headquarters in New York City.

Carroll C. Parker, who joined U. S. Rubber Co. in 1937, has been appointed grinding wheels sales manager for the Mechanical Goods Division succeeding J. A. Fairfield, who retired on March 1 after 26 years service.

W. N. Fieglein, previously foreman in the Production Department, has been appointed to the southwest sales territory of Emery Industries, Inc., to handle the company's complete line of fatty acids.

Clarence H. Mingle, vice-president of the Gates Rubber Co., has been named to the company's newly created post of director of marketing.

Philip H. McLaughlin, formerly head of the Sales Development Department, has been appointed manager of sales administration at the New York office of the Stauffer Chemical Co.

Henry W. DeVore, associated with Plaskon plastics and resins since 1932, has been named director of Plaskon plastics and resins sales for the Barrett Division of the Allied Chemical & Dye Corp.

George C. Stephens, previously associated with the U. S. Rubber Co., has been appointed sales engineer for tube and hose fittings and O-rings for sealing applications by the Parker Appliance Co.

Howard H. Leiner, formerly associated with the National Lead Co., has been appointed executive chemist for Resin Research Laboratories, Inc.

Vincent D. Nutile and Joseph H. Koslowski have been appointed technical representatives in the New England area for the Coatings and Adhesives Department of the Chemical Division, Borden Co.

J. E. Gulick, vice-president of manufacturing for the B. F. Goodrich Co., was recently presented with a wrist watch in recognition of his 30th anniversary with the company.

William E. Glidden, founder and former president of Glidden Coating Co., has become associated with the Protective Coatings Division of Metalweld, Inc.

W. J. Canavan, former manager of the Extrusion Materials Division of the Bakelite Co., has been appointed assistant manager of the company's New Product Engineering Department.

E. R. Leonhard was elected president of the Paterson Parchment Paper Co. at the annual stockholders meeting.

Edward V. K. Jaycox, formerly senior associate of the Advance Planning Division of the Firestone Tire & Rubber Co., has been named administrative assistant to J. E. Trainer, executive vice-president.

William J. Reddington, associated with the U. S. Rubber Co. since 1933, has been appointed district sales manager at St. Louis, Mo., for the Mechanical Goods Division.

S. G. Gregory has been named to the newly created position of director of personnel services for the Borg-Warner Corp.

William K. Taft, Jr., has rejoined the B. F. Goodrich Chemical Co. following two years of military service and has been assigned as a technical man at the Akron experimental station.

Dr. Leo A. Wall, a chemist at the National Bureau of Standards and a recognized authority in the field of polymerization chemistry, has been presented with the Arthur S. Flemming Award, given annually to outstanding young men in government.

P. W. Litchfield, chairman of the board of the Goodyear Tire & Rubber Co., has been presented with a certificate of appreciation by the Rubber Manufacturers Association for his accomplishments as an outstanding leader in American industry.

A. R. Webber, formerly a process control engineer in the Product Improvement Department of the B. F. Goodrich Chemical Co., has been assigned to work on economic planning of production operations.

C. E. Jones, vice-president and comptroller of the Seiberling Rubber Co., has been named chairman of the United Fund-Red Cross campaign in Barberton, Ohio.

Milton Rex Wingard, formerly associated with the Blaw-Knox Co., has been appointed vice-president and technical director of Davidson-Kennedy Associates Co., designers and builders of chemical process plants and facilities.

E. R. Zimmerman has been promoted to supervisor, general section, Interplant Department, Firestone Tire & Rubber Co. He was formerly administrative assistant to the company's executive vice-president.

Roy Lippincott, previously associated with the Rotary Lift Co., has been appointed manager of oil industry sales by the Electric Hose & Rubber Co.

William L. Abramowitz, formerly a vice-president of the Chemical Division of the Borden Co., has been elected president of Carlon Products Corp., Cleveland, Ohio.

Robert G. Page, president of Phelps Dodge Corp., has been elected a director of the New Jersey Zinc Co.

A. A. Garthwaite, chairman of the board of Lee Rubber & Tire Corp., has been re-elected to his 15th one-year term as a board member of the National Industrial Conference Board.

Arthur W. Sekus, former draftsman-designer in the engineering laboratory of Firestone Tire & Rubber Co., has been appointed assistant chief engineer at the company's Buenos Aires, Argentina plant.

Dr. Jerome C. Hunsaker, professor emeritus of aeronautical engineering at Massachusetts Institute of Technology and a director of the Goodyear Tire & Rubber Co. since 1946, has received the Distinguished Service Medal from the National Advisory Committee for Aeronautics.

Robert V. Yohe, vice-president of sales for the B. F. Goodrich Industrial Products Co., has been elected to the Executive Committee of the American Supply and Machinery Manufacturers Asosciation, Inc.

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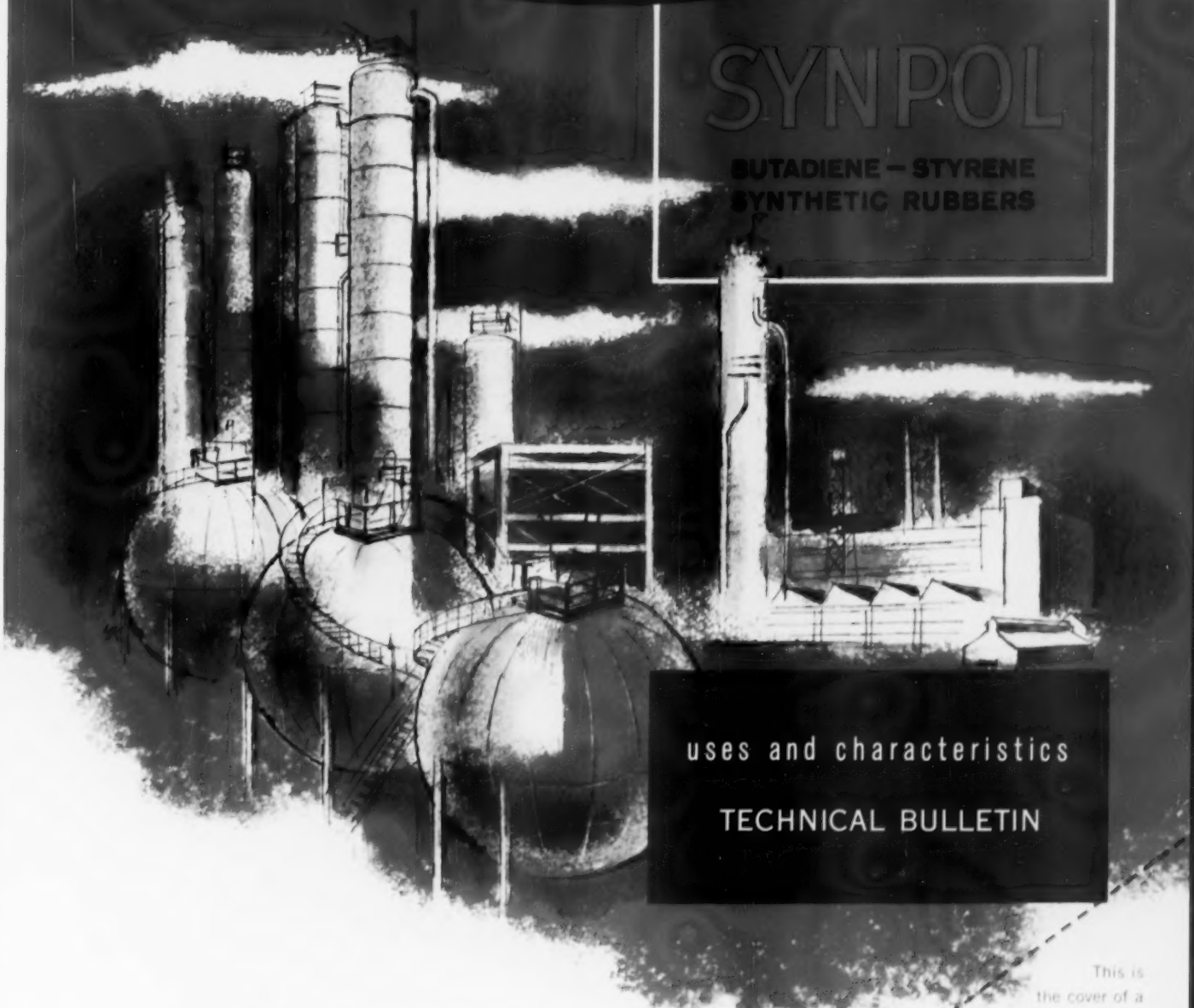

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TECHNICAL BULLETIN

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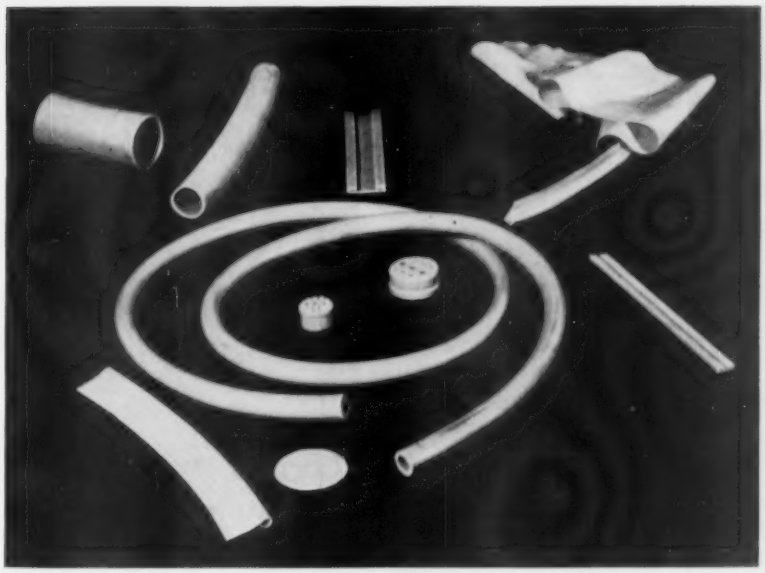
G-E 81716 Silicone Rubber

Introduction of a new silicone rubber compound said to combine the physical strength of organic rubbers with the temperature resistance of silicones, has been announced by the Silicone Products Department of the General Electric Co., Waterford, N. Y. Designated 81716, the compound makes possible production of airframe seals far more rugged than any now in service where temperatures range from —150° to 500°F. Depending on curing processes used in fabrication, 81716 shows physical property values in ranges of 1500 to 1800 psi tensile strength; 600 to 750 per cent elongation and 180 to 225 pounds per inch tear strength. This is the only compound now available to fabricators of rubber components for airframes that meets AMS 3345 requirements for tensile and tear strength, elongation, dry heat resistance, compression set and low temperature flexibility, the company says. The product is also said to meet AMS 3345 values in three of four oil resistance requirements and is marginal in the fourth (tensile strength after prolonged immersion in hot lubricating oil). Tests indicate, however, that 81716 is as strong or stronger after immersion than most silicone rubber prior to oil exposure. The material has been found to have excellent handling characteristics for extrusion, calendering and molding. Developed at G-E's Silicone Product Department, typical aircraft industry applications of this compound include diaphragms, boots and bellows, forming blankets and seals for firewalls, bomb bay doors, wheel and camera wells, hatches, windows and canopies. Supplied with or without a catalyst, it may be cured by a variety of oven, hot air vulcanization or steam cures.



A number of typical products which can be made with G-E silicone rubber compound 81716 are shown above.

Join Goodrich Research Center

B. F. Goodrich Co. has announced three new appointments to the company's Research Center in Brecksville, Ohio. Alan R. Siebert has joined the staff as a research chemist. Jamal S. Eden and Peter Dreyfuss have joined the Center's chemistry staff as technical men. Mr. Siebert is a graduate of Fenn College with a B. Ch. E. degree. He received his Ph.D. in physical chemistry from Western Reserve University in January of this year. Mr. Eden, a native of Jaffa, Palestine, attended American University, Beirut, Lebanon and Washington University, St. Louis, Mo., from which he received a B.S. in 1949. He received an M.A. degree in organic chemistry from the University of Missouri in 1952. Mr. Eden has been associated with the Diamond Alkali Co., Painesville, Ohio, for the last four years. He is a member of the American Chemical Society. Mr. Dreyfuss was born in Frankfurt am Main, Germany. He received a B.S. degree from Union College, Schenectady, N. Y. and a Ph.D. in organic chemistry from Cornell University, Ithica, N. Y. Mr. Dreyfuss is also a member of the American Chemical Society.

Any changes in the information submitted for the 1957-58 RUBBER RED BOOK? Write us today!

Esso Research Promotes Rose

Harold J. Rose, formerly coordinator of chemicals research for the Esso Research and Engineering Co., Linden, N. J., has been appointed assistant general manager of the Chemical Products Department for the Esso Standard Oil Co., New York, N.Y. Mr. Rose received his bachelor's and master's degrees in chemistry from the University of Kentucky and was a member of the faculty of the University from 1940 to 1942. In 1942, he joined Esso Standard at the company's Baton Rouge, La., refinery as a research chemist and was active in the development of synthetic rubbers. From 1948 to 1954 he served as section head in charge of petrochemicals research. Mr. Rose transferred to the Esso Research and Engineering Co. at Linden in 1954 as an assistant director of the Chemicals Research Division. He was named to his most recent post as coordinator of chemicals research for Esso Research in August, 1955.

Asks For Stock Exchange Listing

At its recent annual stockholders meeting, Barry Controls, Inc., Watertown, Mass., announced that the company has applied for listing of its securities on the American Stock Exchange. The stock has been traded over-the-counter since its issuance in February, 1955. A ten-cent quarterly dividend, declared by the board of directors following the meeting, was paid on March 29 to all stockholders of record on March 15, 1957. Ervin Pietz, president, said that sales in 1957 are predicted to run about 20% ahead of last year and that 1957 should be the biggest year in the history of the company. He also announced a new commercial products marketing program with the expectation of increasing commercial sales over last year by at least 50%.

TG Exide-Ironclad Battery

Exide Industrial Division of the Electric Storage Battery Co., Philadelphia, Penna., has announced a basic scientific development which is said to enable manufacturers to pack more storage battery power into a given space. An increase of 44 per cent in the rated capacity of Exide-Ironclad motive power batteries has been achieved within only 3½ years, the company says. This was accomplished through the use of a new type of armored porous tubing to encase the grid spines and active material of the positive battery plates. The new tubing material is impervious to electrochemical action within the battery. It is highly resistant to the attack of acid and to the chemical and physical action within the battery. Tests conducted by Exide's engineering laboratories are said to indicate high capacity, long-life characteristics and superior performance. The new TG Exide-Ironclad battery is available in finished steel trays in 11 sizes with from 11 to 33 plates and capacities ranging from 360 to 1,152 ampere-hours at the 6 hour discharge rate.

Huber Reorganizes Sales Areas

J. M. Huber Corp., New York, N. Y., has announced that the company is opening a new office in Buffalo, N. Y. and extending the area serviced by the Chicago office. The Buffalo office will cover plants located in Canada, western New York and western Pennsylvania. The Chicago office will serve Huber customers in western Michigan, Indiana, Illinois and west and south to Texas. Customers in Ohio and eastern Michigan are now being handled from Huber's new Akron office which opened on April 1. These offices will be responsible for sales of carbon blacks, clays, reinforcing pigments and chemicals.

Firestone Akron Appointments

Four appointments in the Akron plants of the Firestone Tire & Rubber Co. have been announced recently by H. H. Weidenmann, production manager. W. R. Clarke, former Plant 2 factory manager, has been named operating manager to Mr. Weidenmann. C. L. Crandall succeeds Mr. Clarke as Plant 2 factory manager and R. L. Girton and R. M. Jeffries have been named Plant 1 division managers. Mr. Clarke succeeds M. A. Ulman who is retiring. Mr. Clarke is a 27-year veteran with Firestone. He completed the company's college training course in 1930 and entered materials preparation. He was transferred to Brentford, England, in 1935. Mr. Clarke was assigned to the company's Sao Paulo, Brazil, plant as production manager from 1940 to 1945 and factory manager from 1945 to 1948. He returned to Akron in 1948 and was named Plant 2 factory superintendent in 1951 and factory manager in 1955.

Mr. Crandall, a graduate of Michigan State university, joined Firestone's college training class in 1937. He served as a powerhouse engineer and later as a processing control and compounding engineer in the general laboratories. He was transferred to Buenos Aires in 1942 to head the company's technical department there. In 1948 he was appointed production manager of the Port Elizabeth, South Africa, plant.

Mr. Crandall returned to Akron in 1950 for special assignments. He was named division manager of materials preparation, Plant 1, in 1953 and production manager in 1956. Mr. Jeffries' new job covers tire building, curing and final inspection at Plant 1. Mr. Girton will supervise materials preparation, tubing, calendering and stock cutting, bead building and sub assembly.

Acquires Emmett Machine

Taylor Instruments Companies, Rochester, N. Y., have acquired MacLee Industries, Inc., and its subsidiary, Emmett Machine & Manufacturing, Inc., of Akron, Ohio. Taylor will continue to operate Emmett under the name of Taylor-Emmett Controls, Inc. Founded in Akron in 1946, Emmett manufactures valves and controls which are widely used in the rubber industry. MacLee Industries, formerly of Lima, Ohio, took over Emmett in 1952. Taylor is providing Taylor-Emmett Controls with sufficient capital to pay off all its creditors, Emil Dumas, vice-president and controller of the Akron concern, said. Mr. Dumas will continue to head Taylor-Emmett Controls. Mark E. Porter of Taylor has been named president of the Akron company, and Rodney C. Mertz has been named secretary. Other officers are E. B. Sutherland, vice-president in charge of engineering, and Henry Maurer, vice-president in charge of sales.

The U. S. Rubber Exhibit Hall in Radio City displays the "House of Tomorrow" which demonstrates uses to which products of its Naugatuck Chemical Division fit into modern day living.

Leaves Commodity Exchange Post

Robert Badenhop

Robert Badenhop, chairman of the board of Robert Badenhop Corp., New York, N. Y., has been succeeded as president and chairman of the Commodity Exchange Rubber Clearing Association, Inc., by Frederick T. Koyle of Carl M. Loeb, Rhoades & Co., New York, N. Y. At a meeting of the board of directors of the Commodity Exchange, held on February 26 in New York City, Mr. Badenhop asked not to be re-elected to the offices. Thereupon, the directors elected Mr. Koyle to the positions held by Mr. Badenhop and also elected Joseph Louis of Littlejohn & Co., New York, N. Y., as vice-president.

Mr. Badenhop had been elected president and chairman of the Clearing House in March, 1938, and had been acting in that capacity for 19 years. A veteran in the crude rubber business, Mr. Badenhop first spent five years in England and Germany as a salesman of crude rubber. He came to the United States on April 21, 1907, and shortly afterwards began a tour of this country and Canada to sell rubber. In 1909, he set up his own rubber import business, which became the Robert Badenhop Corp., one of the largest rubber importers in the world. Mr. Badenhop is chairman, Robert A. Badenhop is president, and Norman Badenhop, vice-president and secretary of the company.

Mr. Badenhop was also active in helping to organize the rubber trade in this country. He was one of the organizers and founders of the Rubber Trade Association of New York, Inc., in 1913, and served for a good many years on the board of directors and as its president and chairman. Prior to starting his own business in 1909, Mr. Badenhop evolved a private cable code, which enumerated close to three hundred grades and qualities of wild rubber, plantation rubber and the kindred products of Balata, Gutta Percha and Gutta Jelutong. In 1926, Mr. Badenhop helped to found the Rubber Exchange, of which he became a director, and he was also active in the formation of the Commodity Exchange. Mr. Badenhop celebrates his seventy-fifth birthday in June.

Seeks To Acquire Company

Seiberling Rubber Co., Akron, Ohio, is actively seeking acquisition, by purchase or merger, of another company in a related field, J. P. Seiberling, chairman, announced at the annual meeting of stockholders. Mr. Seiberling said that the company's directors "took steps" to speed up the search for a related company in the past month. He did not specify what those steps were. All directors were re-elected at the meeting, with more than 90 per cent of the company's common shares voting. Management forces last month signed an agreement with Edward Lamb, who conducted an unsuccessful proxy fight last year, to vote for a joint 15 man slate. At an organizational meeting of directors, L. M. Seiberling, vice-president in charge of sales, was elected vice-chairman of the board in addition to his sales officership. All other officers were re-elected. They are: J. P. Seiberling, president and chairman; H. P. Schrank, executive vice-president; R. J. Thomas, C. E. Jones and E. A. Hensal, vice-presidents for treasury, comptroller and production; W. P. Seiberling, secretary; H. E. Thomas, assistant secretary-treasurer; R. L. Perkins, assistant secretary and counsel. Directors re-elected were: A. C. Blinn, L. M. Buckingham, P. A. Frank, Edward Lamb, J. Howard McGrath, F. C. Oswald, H. E. Paige, M. H. Pendergast, H. P. Schrank, J. P., L. M., and W. P. Seiberling, T. Tyler Sweeny and R. J. Thomas.

Tracerlab Opens New Plant

Tracerlab, Inc., which started in 1946 with six employees, has dedicated an ultramodern building in Waltham, Mass., consolidating its East Coast operations under one roof. Previously housed in seven separate locations in Boston, all of the company's East Coast operations, including manufacture of nuclear and X-ray equipment, sales offices, engineering and research departments, radiochemical facilities and general administration have been provided for in the 164,000 square feet of floor space. The company now does some $12,000,000 worth of business a year in the nuclear and X-ray fields and employs about 800 persons. The company is said to be the world's largest commercial radiochemical facility with the largest integrated organization for radiation consulting, research and instrument manufacture.

General Tire Appoints Two

Two major appointments have been made to the staff of the General Tire & Rubber Company's new synthetic rubber plant at Odessa, Texas. James B. Bond was named personnel manager and John A. Peterson was appointed to the position of comptroller. Mr. Bond assumes responsibility for staffing the plant in addition to all the other duties of personnel managment. He had been on assignment for the company at the Waco, Texas, tire plant as personnel interviewer. Mr. Peterson was chief accountant with American Smelting & Refining Co. in Denning, New Mexico, prior to his assignment as comptroller at Odessa.

Ritz Promoted by Emery

James W. Ritz

James W. Ritz has been promoted to the position of assistant sales manager of the Organic Chemical Sales Department of Emery Industries, Inc., Cincinnati, Ohio. Mr. Ritz will have direct responsibility for the sales of Emery's line of plasticizers, lubricant esters, fatty acid esters, azelaic and pelargonic acids, and high-molecular weight polybasic acids. He succeeds R. T. Hull, recently named vice-president and general manager of Emery's newly acquired Canadian subsidiary, Emery Industries (Canada) Ltd. Mr. Ritz joined Emery in 1941 as a research chemist. Several years later he transferred to the Sales Department in the Philadelphia area. In 1949, he was made district manager of that office, and in 1953 was named Eastern district manager of Emery's Chemical Sales Department. A graduate of the University of Cincinnati, Mr. Ritz is a member of the American Chemical Society, the American Association of Textile Chemists and Colorists, the Chemical Club of Philadelphia, and the Philadelphia Rubber Group.

Three New Elastomer Licenses

Three additional foreign companies have been licensed to produce vinyl foam by the Elastomer process, according to the Girdler Co., Louisville, Ky. Girdler, a division of the National Cylinder Gas Co., is the exclusive licensor of the process in all foreign countries except Canada. The three new licensees are: Oy Finlayson-Forssa AB, Finland; Nippon Hikaku Kabushiki Kaisha (Japan Leather Manufacturing Co., Ltd.), and Imperial Chemical Industries, Ltd.

Chase Names Representative

Chase Chemical Corp., Pittsburgh, Penna., has announced the appointment of Innis, Speiden & Co., Inc., 1607 Howard Street, Chicago, Ill., as exclusive representative for Wisconsin, Illinois, Indiana, and western Michigan. Norman Scheffel of Innis, Speiden, will sell Chase naphthenate and tallate paint driers, and Chase's new line of polyisocyanate resins for urethane foams.

FINANCIAL BRIEFS

L. Albert & Son reports holdings of 137,683 common shares of the Bellanca Corp., after sales of 230,894 shares from August of last year through February, 1957. The report notes that all of the shares involved were sold by persons to whom L. Albert & Son pledged the stock as collateral or by persons to whom L. Albert & Son had made loans of such stock.

A. M. Sonnabend, in an original report, shows direct holdings of 42,000 common shares of the Thermoid Co. on April 9. Charles Wohlstetter, also in an original report, shows partnership holdings of 4,000 common shares on April 9. Messrs. Sonnabend and Wohlstetter are both directors of the company.

Samuel D. Lunt, a director of the National Rubber Machinery Co., has sold 1,000 shares to the American Seal-Kap Corp., eliminating his direct holdings. American Seal-Kap is direct owner of more than 10% of the common stock of National Rubber Machinery. It recently purchased 7,000 shares, increasing its direct holdings to 98,200 shares.

Stockholders of Hewitt-Robins, Inc., have authorized an increase in $5 par common stock to 750,000 shares from 500,000.

Bassons Industries Corp., Yonkers, N. Y., has filed a voluntary proceeding under Chapter XI of the Chandler Act listing liabilities of $1,039,219 and assets of $1,570,005 as of January 31, 1957. Settlement of claims in 5 equal annual installments is proposed.

New Union Carbide Officers

A. Lyndon Foscue, Birny Mason, Jr., and Edwin B. Suydam have been elected vice-presidents and appointed members of the Appropriations Committee of the Union Carbide and Carbon Corp, New York, N.Y. Mr. Foscue has been with Union Carbide since 1924 when he joined the Electro Metallurgical Co. at Niagara Falls as a chemist. He later became works manager, then vice-president and, in 1953, president. He was also appointed president of Haynes Stellite Co. in 1954. Mr. Mason joined Union Carbide in the Research Department of Carbide and Carbon Chemicals Co., South Charleston, West Va., in 1932. In 1952 he became manager of industrial relations for Union Carbide. He holds the positions of secretary of the corporation and president of one of its divisions, Union Carbide Development Co. Mr. Suydam joined Union Carbide in 1916 as a sales representative for the Union Carbide Sales Co. in New York. He remained with that company until 1928 when he was made manager of the Southwestern region of Linde Air Products Co. He became vice-president of Linde in 1942 and president in 1955.

Want to make a change in the information submitted for the 1957-58 RUBBER RED BOOK? Write us today!

Firestone Promotes McCready

Charles J. McCready

Charles J. McCready has been named general manager of the Fall River, Mass., plant of the Firestone Tire & Rubber Co. succeeding Frank L. Armitage who will retire May 31. Mr. McCready will direct production at the company's Foamex manufacturing center. Rubber coated thread, defense products and mechanical rubber goods also are produced at the east coast plant. The new general manager is an 18-year veteran with Firestone. He joined the company in 1939 after working as a researcher with a chemical firm. Mr. McCready successfully completed Firestone's college training course and was assigned to the research laboratories. He was named manager of barrage balloon production in 1941 at Fall River. Mr. McCready was advanced to Foamex department manager in 1945. He later became manager of the plant's Foamex Division, a position he held until his recent promotion. He was graduated from the University of Pittsburgh in 1936. He later attended Pittsburgh's Mellon Institute of Industrial Research.

Drogin Returns to U.S.

Dr. Isaac Drogin, vice-president in charge of research of the United Carbon Co., Charleston, West Va., has returned to the United States after an extensive trip abroad. During his trip, Dr. Drogin visited rubber and chemical companies as well as other technical installations in 20 different countries throughout the world. His trip involved seventy-one separate airplane trips and five separate steamer trips. On different occasions during his travels, Dr. Drogin addressed various technical and business organizations.

Fritton Named Vice-President

William J. Fritton was appointed vice-president of the U. S. Rubber Reclaiming Co., Inc., Buffalo, N.Y., at the April meeting of the board of directors. Mr. Fritton, a graduate of the College of Engineering, University of Alabama, will direct corporate activities concerning production, engineering, industrial relations and purchasing. He joined the company in November, 1956, as assistant to the president.

Financial News

Anaconda Wire & Cable Co.

For 1956: Net income of $9,624,274, which is equal to $11.40 a share, compared with $7,015,496, or $8.31 a share, the year before. Sales in 1956 totaled $159,352,097 compared with $145,217,992 the year before. According to the company the record sales and income resulted from a high level of industrial and commercial construction; higher market prices for copper and aluminum; new facilities brought into operation; new products added to the line; intensified advertising and sales promotion and an expanded sales force. H. Donn Keresey, president, said the demand for wire and cable products should continue to increase for a number of years.

Thermoid Company

For 1956: Net income of $1,871,632, which is equal to $2.13 per common share, compared with $1,614,343, or $1.88 a share, in 1955. Sales in 1956 totaled $38,210,747, compared with $37,270,469 the year before. The figures cited include the parent company and its subsidiaries. Current assets as of December 31, 1956, were $16,134,688 compared with $15,856,025 at the end of 1955. Liabilities at the close of 1956 amounted to $5,619,097 compared with $5,928,170 at the end of the preceding year.

Nopco Chemical Co.

Three months to March 31: Net income of $377,772, which is equal to 75c a share, compared with $358,982, or 71c a share, in the first three months of 1956. Net sales in the first quarter of 1957 totaled $6,890,962 compared with $6,417,557 in the corresponding period of the previous year.

Electric Auto-Lite Co.

Quarter to March 31: Net income of $3,706,272, which is equal to $2.31 per share, compared with $1,177,712, or 74c a share, in the same period of the preceding year. Net sales in the first quarter of 1957 totaled $80,630,126, compared with $60,875,816 in the corresponding period of 1956.

DeVilbiss Company

For 1956: Net income of $1,790,625, which is equal to $4.98 a common share, compared with $1,482,616, or $4.01 a share, in the previous year. Sales in 1956 totaled $22,651,278 compared with $20,071,418 the year before.

American Enka Corp.

Twelve weeks to March 24: Net income of $577,000, or 43c per share, compared with $1,082,244, or 80c a share, in the corresponding period ending March 25, 1956.

National Rubber & Machinery Co.

For 1956: Net income of $691,111, which is equal to $3.53 per common share, compared with $636,249, or $3.25 in the preceding year. Sales in 1956 amounted to $16,154,858 compared with $11,553,876 the year before. A number of factors contributed to a lower rate of profit on sales in 1956, the company said. Among these were the rising cost of labor and material; a six weeks' strike of Akron shop employees; enlarged engineering and selling forces and increased expenditures for new product development.

Sheller Manufacturing Corp.

For 1956: Net income of $1,271,606, which is equal to $1.33 per share, compared with $3,754,515, or $3.94 per share, in the previous year. Sales in 1956 amounted to $41,071,196 compared with $55,593,663 in the preceding year. The company's annual report said that despite the 1956 decline in both sales and production, economic experts continue to predict new record highs for the automotive industry in future years.

B. F. Goodrich Co.

Quarter ended March 31: Net income of $10,160,824, which is equal to $1.14 a share, compared with $10,082,972, or $1.14 a share in the same quarter of 1956. Sales in the first quarter of 1957 totaled $183,684,493 compared with $180,295,218 in the same period of the preceding year.

H. K. Porter Co.

For 1956: Net income of $7,594,533, which is equal to $7.07 per common share, compared with $6,433,107, or $6.15 per share, the year before. Sales of the company and its subsidiaries in 1956 totaled $140,668,096, compared with $106,099,816 in 1955.

Whitney Blake Co.

For 1956: Net income of $1,008,173, which is equal to $4.81 a common share, compared with $226,772, or $1.11 a share, the year before. Net sales in 1956 amounted to $15,554,683 compared with $12,187,452 in the preceding year.

Acushnet Process Co.

For 1956: Net income of $717,256, which is equal to $2.95 a share, compared with $985,166, or $4.26 a share in 1955. Sales in 1956 totaled $13,935,016, compared with $14,811,305 in the previous year.

Kleinert Rubber Co.

For 1956: Net income of $523,291, which is equal to $1.75 a share, compared with $533,057, or $1.76 a share, the year before. Sales totaled $12,381,995 in 1956 compared with $11,718,528 in 1955.

McNeil Machine Co.

For 1956: Net income of $3,073,733, which is equal to $5.07 per share, compared with $2,435,353, or $4.22 a share, in the preceding year. Sales amounted to $36,410,268 in 1956 compared with $23,748,979 in 1955. Income in 1956 represented an increase of 26 per cent over 1955 and sales an increase of 53 per cent over sales of the previous year. The figures include those of Hamlin Metal Products Corp. of Akron from Feb. 1, 1956 and the Lincoln Engineering Co. of St. Louis from April 27, 1956. These two subsidiaries were acquired as of those dates.

Kaiser Aluminum & Chemical Corp.

For 1956: Net income of $42,349,131, which is equal to $2.71 per common share, compared with $36,021,114, or $2.43 a share, in 1955. Sales in 1956 were $343,626,585 an increase of 14 per cent over the previous year's $301,031,135. A seven month report including the period from June 1 to December 31, 1956 showed net earnings of $20,320,822. The report was issued in connection with the corporation's recent change to a calendar fiscal period from the former fiscal year ended May 31.

American Biltrite Rubber Co.

For 1956: Net income of $1,210,480 compared with $840,154 in the preceding year. Sales in 1956 totaled $38,434,079 compared with $32,948,825 in 1955.

O'Sullivan Rubber Corp.

For 1956: Net income of $3,369 compared with a net loss of $26,242 the year before. Sales in 1956 amounted to $6,346,080 compared with $6,475,452 in 1955.

Thiokol Chemical Corp.

Quarter to March 31: Net income of $298,505, which is equal to 62c a share, compared with $156,874, or 41c a share, in the corresponding quarter of 1956.

Allen Industries, Inc.

Quarter to March 31: Net income of $447,235, which is equal to 73c a share, compared with $380,287, or 62c a share in the first quarter of the preceding year.

Barry Controls Inc.

Quarter ended March 31: Net income of $79,026, which is equal to 26c per share, compared with a net loss of $6,505 in the same period of 1956.

Pantasote Co.

For 1956: Net income of $104,767 compared with $2,270 the year before. Sales in 1956 totaled $4,418,284 compared with $4,533,372 in 1955.

Pierce & Stevens Chemical Corp.

For 1956: Net income of $453,551, which is equal to $1.40 per share, compared with $394,932, or $1.22 a share, in 1955.

Executive Appointments Announced

W. Adrian King

W. Adrian King, former manager of the Automotive Products Department of the Olin Mathieson Chemical Corp., has been appointed general sales manager of the Industrial Chemicals Division of the company. He joined the former Mathieson Chemical Corp. in 1953 as manager of hydrocarbon chemical sales. Before that, he was midwestern sales manager of the Plastics Division of the American Cyanamid Co. James C. Laney succeeds Mr. King as manager of the Automotive Products Department. He was formerly national accounts sales manager of the department, which is responsible for sales of the company's anti-freezes and other automotive specialty chemicals. James F. Newell, formerly manager of the Products Department, has been appointed assistant general manager of the Industrial Chemicals Division and will be succeeded as production head by Charles C. Hightower, former manager of the Lake Charles, La. plant. W. Carlton Moseley, previously assistant plant manager at Lake Charles, has been named plant manager. Cecil L. Williams, who has been manager of the division's Administrative Service Department in Baltimore, Md., has been appointed assistant to the division's general manager.

Butadiene Plant on Stream

Texas Butadiene & Chemical Corp. has brought on stream the first of two 43,000 tons-per-year Houdry Dehydrogenation Process units at its new $30,000,000 dual purpose plant located at Channelview, Texas, just outside Houston. The second unit is scheduled to be placed in operation shortly. The Houdry Dehydrogenation units will produce butadiene, as well as butylenes as feed for making aviation gasoline. When both units are on stream, the plant will produce 61,000 tons of butadiene annually and roughly 2½ million barrels of aviation grade alkylate or, alternatively, 86,000 tons per year of butadiene. This is the first new butadiene plant to be completed by private industry since World War II, and it is the third such plant to use the Houdry Dehydrogenation Process.

2-MT Special Purpose Accelerator

A fast-curing accelerator, "2-MT," is now being offered to rubber compounders by the Rubber Chemicals Department of the American Cyanamid Co. Designed as a special-purpose accelerator, 2-MT, or 2-Mercaptothiazoline, has been shown by tests to contribute to vulcanizates such superior properties as higher modulus, increased age resistance, retention of tensile strength and tear resistance at elevated temperatures, greater resistance to flex-cracking and substantially reduced heat build-up, the company states. A creamy white powder, non-toxic in normal industrial use, 2-MT is adapted particularly to compounding rubbers for tires, belts, mechanical goods and for other applications requiring good aging properties and retained resilience. Extensive tests to natural rubber channel black tread or carcass stocks show 2-MT imparts good physical properties. When used with cold camelback stocks, it has been found to increase mileage. 2-MT's superior heat resistance in latex compounding for rug backings and latex threads for garments satisfies these demanding applications.

Adding Wing to Akron Office

In order to keep pace with expanding business in synthetic rubbers and related products, E. I. du Pont de Nemours & Co., Inc., has announced plans to construct a new wing to its Akron, Ohio, district sales office and laboratory. The new addition will expand sales and development service to customers in the Akron and Chicago districts. It will include additional laboratory facilities for Hypalon synthetic rubber and Hylene organic isocyanates, expanded office space for the sales force, and adequate clerical facilities to service both the sales group and the laboratory technical staff. Designed primarily to provide technical service on neoprene, Hypalon, Hylene and rubber chemicals, the laboratory can duplicate on a pilot-plant scale many operations in rubber manufacture. Construction of the Akron addition is scheduled to begin shortly with completion expected late this year.

LABOR NOTES

U. S. Rubber Co., New York, N. Y., and the URW have reached an agreement on a new two-year company-wide contract embodying 20 improvements highlighted by three weeks vacation for employees with 11 years of service and four weeks vacation for employees with 25 years of service. The contract also provides for funeral pay up to a maximum of three days in the event of a death in the immediate family, and a maximum of two weeks military reserve make-up pay if an employee is called to temporary active duty. Wages were discussed but were deferred until a later date. The new contract contains a 60-day wage reopening clause. Nineteen plants in 11 states employing more than 30,000 persons are covered by the new agreement which was signed on April 9 after seven weeks of negotiations.

Zito Joins Thiokol Chemical

Thomas J. Zito

Thomas J. Zito has recently joined the sales staff of the Thiokol Chemical Corp., Trenton, N. J., as technical sales representative. Mr. Zito has been active in the chemical industry for over five years. He was previously employed as technical sales representative with the Sun Chemical Corp. of Long Island City, N. Y. Mr. Zito is a native of Brooklyn, N. Y. He obtained a B.S. degree in chemistry at Long Island University.

Damping Literature Bibliography

A bibliography of the literature on damping devices for mechanical vibrations published between 1924 and August, 1956, has been prepared by the Navy and released for industry use through the Office of Technical Services, U. S. Department of Commerce. The references cover studies of vibration damping by increasing mechanical impedance of the system, by energy dissipation, or by tuned attachments, and of vibration isolation by vibration dampers, connection damping, and material damping. The volume, PB 121299 "Devices for Damping Mechanical Vibrations, A Bibliography" by M. Benton, Naval Research Laboratory, December, 1956, may be ordered from OTS, U. S. Department of Commerce, Washington, D. C. It contains 101 pages and is available at $2.75 a copy.

Air Force Research Reports

One hundred and forty-five reports of research conducted under the Air Force's materials research and development program from July 1, 1955, to June 30, 1956, have been abstracted in a publication recently released through the Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. The publication contains abstracts of research in adhesives, metallurgy, analysis, and measurement, biochemistry, textiles, petroleum products, plastics, packaging, protective treatments, and rubber. The report, "A Review of the Air Force Materials Research and Development Program" (PB 111648-S2), may be ordered from OTS for $2.50 each.

Goodyear Re-elects Officials

All directors of the Goodyear Tire & Rubber Co. were re-elected at the annual meeting of shareholders held in Akron, Ohio, on April 1. These included the following Goodyear executives: P. W. Litchfield, chairman of the board, who has completed 51 years of continuous service as a director; E. J. Thomas, president and chief executive officer; R. S. Wilson, P. E. H. Leroy and R. DeYoung, executive vice-presidents; H. L. Hyde, vice-president and general counsel, and F. T. Magennis, president of Goodyear International Corp. Other directors re-elected were T. M. Girdler, formerly chairman of Republic Steel Corp.; J. C. Hunsaker, Professor Emeritus, Massachusetts Institute of Technology; John P. McWilliams, chairman and president of the Youngstown Steel Door Co.; W. A. Patterson, president of United Air Lines, Inc.; Robert G. Payne, financial consultant; B. A. Polsky, chairman of the A. Polsky Co.; Kenneth A. Spencer, president of Spencer Chemical Co.; C. F. Stone, financial consultant; J. C. Virden, president of Eaton Manufacturing Co., and Lewis B. Williams, honorary chairman of the National City Bank of Cleveland.

At the board meeting following the annual meeting of shareholders, all executive officers of the Goodyear Tire & Rubber Co. were re-elected. They are: Mr. Litchfield, chairman of the board; Mr. Thomas, president and chief executive officer; Messrs. Wilson, Leroy and DeYoung, executive vice-presidents; Mr. Hyde, vice-president and general counsel; R. P. Dinsmore, L. E. Spencer, V. Holt, Jr., and F. J. Carter, vice-presidents; Z. C. Oseland, treasurer; A. E. Firestone, secretary; H. W. Hillman, comptroller; J. F. Bennett and D. H. Walker, assistant treasurers; R. H. Miner and G. F. Clayton, assistant secretaries; H. L. Riddle, R. G. Woodling, B. D. Scherer and J. H. Long, assistant comptrollers.

Borden Opens Southern Unit

The second southern formaldehyde and resins plant of the Borden Co., New York, N. Y., was opened at Fayetteville, N. C. on Friday, April 19. Geared to produce 36,000,000 pounds of formaldehyde annually, the plant was formally activated by A. R. Marusi, president of the company's Chemical Division, at open house ceremonies attended by company executives and civic and industrial leaders from the southern area. The fully automated unit employs 25 workers and will manufacture urea resins, wet-strength resins and resins for sizing and finishing textiles, as well as formaldehyde. The plant will also serve as a warehouse for polyvinyl acetate and polyvinyl alcohol. A steel and concrete structure, this is Borden's fifth formaldehyde production unit in the United States. The new plant, the first to be completed during the company's Centennial year, also marks an important step in Borden's progress and development in the chemical field, boosting the company's aggregate formaldehyde production to 12 per cent of total domestic consumption.

Acquires Lawrence Process

Chemical Division of the Borden Co., New York, N. Y., has acquired the Lawrence Process Co., Inc., North Andover, Mass., which will be operated as a wholly owned subsidiary. The Lawrence Process 46,000 square foot factory was completed two years ago. It is a completely integrated extrusion and compounding plant and includes a laboratory and die machine shop facilities for the manufacture of its own dies and specialized equipment. With the acquisition of Lawrence Process, Borden becomes the first extruder of vinyl products with both east and west coast plants, the company says. Last year, Borden acquired Resin Industries of Santa Barbara, Calif., now known as the Resinite Department of the company's Chemical Division. The new acquisition will supplement Santa Barbara's production of Resinite products. Grant C. Ehrlich, manager of Borden's Resinite Department will have responsibility for coordinating operation of the two plastic extrusion plants.

SEC Suspends Bellanca Trading

The Securities and Exchange Commission, on April 24, suspended trading in the $1 par common stock of the Bellanca Corp. on the American Stock Exchange for a period of ten days. Simultaneously, the Commission announced an investigation to determine whether Bellanca should be suspended for a longer period or withdrawn "for alleged violations of the disclosure and reporting requirements", of the Securities Exchange Act, current reports say. The Commission cited a number of instances in which its staff had found apparent violations; most recently in the preliminary proxy soliciting material that the company filed with the Commission in the last two months. A hearing was to have been held on May 8 at S.E.C. offices in Washington, D. C.

Pennsylvania Salt Changes Name

Shareowners of Pennsylvania Salt Manufacturing Co., Philadelphia, Penna., have approved "Pennsalt Chemicals Corporation" as the new official name of the company. The change was made to provide a name more descriptive of the company's present activities as a producer of chemicals for industrial, farm and home use. Re-election of four directors also took place at the meeting. Elected were: Francis Boyer, president of the Smith, Kline and French Laboratories; William P. Drake, president of Pennsalt Chemicals Corp.; Charles B. Grace, president and treasurer of Heintz Manufacturing Co.; and Fred C. Shanaman, vice-president of Pennsalt Chemicals. Shareowners also voted to amend the company's articles of incorporation to broaden its statement of purpose, to increase authorized common stock to 2,000,000 shares and to eliminate preemptive rights. In addition, an increase in authorized indebtedness to $50,000,000 and an amendment of by-laws to provide for a stock purchase plan for employees was approved.

Join Sirvene Technical Staff

Sirvene Division of the Chicago Rawhide Manufacturing Co., Chicago, Ill., has announced the appointment of Henri V. Krakowski and T. M. Loring to the technical staff. Mr. Krakowski was graduated from the University of Zurich with a Master of Science degree in chemical engineering. He was formerly associated with the Chicago-Allis Mfg. Co. and previous to that he was with Armour Pharmaceutical Co. and Albert Trostel Packings, Ltd. Mr. Loring, a graduate of Michigan State University, has a Bachelor of Science degree in chemical engineering and a Master of Science degree in chemistry. Previously, he was associated with Michigan Precision Molded, Inc., G. M. Tech Center and Industrial Rubber Products.

"Says he wants to speak to someone in the vulcanizing department."

Grimley Named General Manager

Arthur C. Grimley

The appointment of Arthur C. Grimley as general manager of the Essex Rubber Division of the Thermoid Co., Trenton, N. J., was made recently by Warren E. Hill, president. Mr. Grimley replaces Joseph E. Cox who has been named executive vice-president. Associated with Essex Rubber since 1936, Mr. Grimley has previous sales and managerial affiliations with the U. S. Rubber Co., and the Rubber Manufacturers Association. During World War II, he served in an advisory capacity to the Office of Price Administration, the War Production Board and the War Surplus Administration.

To Construct New Laboratory

A new research laboratory for the development of special chemicals for the synthetic rubber industry will be constructed at Pensacola, Fla. by the Heyden Newport Chemical Corp., New York, N. Y. Construction is scheduled for completion in the first quarter of 1958. The new laboratory will contain enlarged pilot plant facilities and will provide broader technical service on Heyden Newport's synthetic rubber chemicals, company officials said. An expanded research program will be directed towards the development of new emulsifiers, tackifiers, antioxidants, accelerators, retarders and other specialties for both the polymerization and compounding of synthetic rubber. Broad application for these chemicals are expected in improving performance of synthetic rubber in tires and footwear as well as in a variety of industrial uses.

Develops New Caulking Compound

A synthetic rubber caulking and sealing compound, called "Sonolastic Sealing Compound" has been developed by the Building Products Division of L. Sonneborn Sons, New York, N. Y. The compound is a liquid made up of sulfurized rubber polymers and an activating agent. Available in 10 and 2½ pound units, consisting of both base and activator, the 10 pound unit will fill a 200 cu. in. volume. This unit is available in neutral, tan, black, aluminum and gray.

ASME Forms New Group

The American Society of Mechanical Engineers has formed a new group to deal with the increasingly complex engineering problems encountered in keeping industrial equipment in operating condition. The unit will cover such topics as modification of equipment and facilities to reduce or eliminate maintenance problems; corrective measures, including the development and use of special instruments; managerial activities, such as organization, planning and keeping of records. As part of the program, the group will sponsor technical papers to be presented at national meetings of ASME, and, in the future, may sponsor conferences in various parts of the country to consider special maintenance problems.

The objective of the group is to help keep engineers up to date on the new developments in the field of maintenance or plant engineering. First technical papers under sponsorship of the organization are expected to be presented at the Semi-Annual Meeting of the Society to be held in San Francisco, Calif., in June. Guerard Mackey, of the Engineering Department at E. I. duPont de Nemours & Co. Inc., Wilmington, Del., is chairman of the new group. Other members of the executive committee are: secretary, Robert H. Moore, Philadelphia Electric Co., Philadelphia, Penna.; John K. Bryan, Union Electric Co., St. Louis, Mo.; Benjamin G. Evans, Eli Lilly & Co., Indianapolis, Ind.; and Arthur W. Weber, Corning Glass Works, Corning, N. Y.

Dunlop Organizational Changes

S. A. Mousley, former general sales manager of the General Rubber Goods Division of the Dunlop Rubber Co., Manchester, England, has been appointed general manager of the Belting Division, with headquarters at Speke. B. J. Haill, previously general works manager at Cambridge St., Manchester, succeeds Mr. Mousley. Mr. Mousley joined the company at the age of 15 during World War I. He was one of the pioneers at Fort Dunlop before moving to Manchester and has played a prominent part in building up the General Rubber Goods Sales Division. Mr. Haill joined the company at Fort Dunlop as a charge hand at the age of 20. He helped restart Dunlopillo production at Walton after World War II and, as works manager, started the Dunlopillo factory at Hirwaun, S. Wales.

Custom Grinding Service

Sturtevant Mill Co., Boston, Mass., has announced that a new pilot plant is now in operation utilizing four Micronizer fluid energy mills which will handle experimental and custom fine grinding and classification to sizes ranging from 20 microns to smaller than one micron. The capacity of the units, which depends upon the size of the mill and the kind of material ground, ranges from one-half pound to a ton or more an hour. Experimental grinding will be offered at the cost of set-up and labor. Custom grinding bids will be offered upon request.

To Head New Sales District

T. Curry Jones

Establishment of a new Mid-Atlantic sales district with T. Curry Jones as manager has been announced by the Enjay Co., Inc., New York, N. Y. Mr. Jones has moved to Enjay's headquarters in New York from the Akron district, where he has been senior sales representative for two years. He joined the company's Paramins Division in 1948 and transferred to the Butyl Division in 1954. A graduate of the University of South Carolina, Mr. Jones was associated with the Esso Research and Engineering Co. from 1943 until 1948, when he joined Enjay.

Emery Announces Staff Changes

Organic Chemicals Department of Emery Industries, Inc., Cincinnati, Ohio, has announced the appointment of Joseph P. Clancy as eastern district sales manager. In addition, several appointments to the company's sales force were announced: Joseph E. Quinty, Chicago office; William C. Sowers, New York office; and Arthur R. McDermott to succeed Mr. Clancy as New England representative. Mr. Clancy joined Emery in 1949, serving in the southern sales territory. In 1935, he was appointed chemical sales representative in New England. Mr. Quinty has been with Emery since 1953 in the New York-New Jersey area. Mr. Sowers became associated with the company in 1953 as sales representative in the Cleveland, Detroit and Chicago area. Mr. McDermott has been active in sales and development work since he joined Emery in 1956.

Howe & French Elects Three

Howe & French, Inc., Boston, Mass has announced the election of three ne. vice-presidents, each of whom will head a major division of the company's activities and serve as a director. M. Elsworth Nourse, associated with the company for thirty years, will supervise the Laboratory Supply Division. David J. O'Connell, who joined the company in 1935, will take charge of the Industrial Chemical Division. Lee L. Blyler, with Howe & French for about two and one-half years, has been named to head the Manufacturing Division.

M. G. O'Neil Named Vice-President

William O'Neil, president of the General Tire & Rubber Co. has announced the election of Michael Gerald O'Neil as vice-president and executive assistant to the president. M. G. O'Neil was elected to the office of executive assistant to the president in 1951. Born in Akron, Ohio in 1922, M. G. O'Neil was educated at the College of the Holy Cross and the Harvard Graduate School of Business Administration. After serving in the U. S. Air Corps, he began with General Tire in 1946, served at the company's Caracas, Venezuela plant, and was named a member of the board in 1950. He is also director of the Akron Standard Mold Co. and a director of the Aerojet-General Corp.

Along with M. G. O'Neil's election as vice-president and executive assistant to the president, the following officers were elected: W. O'Neil, president; L. A. McQueen, C. J. Jahant, T. F. O'Neil, D. A. Kimball, C. F. O'Neil, J. E. Powers, H. M. Dodge, J. A. Andreoli, vice-presidents; T. S. Clark, treasurer; F. W. Knowlton, secretary; C. A. Hill, J. Little, assistant treasurers, and J. L. Wade, assistant secretary. Howard A. Bellows, vice-president since 1952, has left the parent company to become General Tire's distributor in Philadelphia, Penna.

Expanding Nylon Fabric Plant

U. S. Rubber Co. will spend one million dollars to expand production facilities for nylon tire fabric at its Scottsville, Va. plant, William E. Clark, vice-president and general manager of the company's Textile Division announced recently. The expansion, Mr. Clark said, is part of the Textile Division's program to make available to customers the latest in technological improvements for building better tires. The growing use of nylon fabric by the tire industry makes the expansion necessary.

The Scottsville plant is one of the newest and most modern units in the Textile Division's ten-mill operation. It was originally built by the Defense Plant Corp. in 1944 and operated by U. S. Rubber to produce rayon tire cord for the government. The plant was purchased by U. S. Rubber in 1946. Today it produces both high tenacity rayon tire cord and nylon tire fabric.

Ameripol in Crumb Form

The availability of all hot types of "Ameripol" synthetic rubber in a new crumb form heretofore unavailable has been announced by Goodrich-Gulf Chemicals, Inc. According to J. E. Miller, vice-president-sales, processing equipment has been installed at the Institute, West Va., plant of Goodrich-Gulf to meet volume demands for the rubber in this form. Crumb rubber is especially desirable to manufacturers of cements, mastics, and adhesives. A substantial savings in processing time will result to manufacturers since its use will eliminate the milling or chopping of bales into smaller pieces or pellets to go more easily into a solution, company officials state.

Sandals for Plantation Workers

Firestone Tire & Rubber Co., Akron, Ohio, has announced that Liberian workers on the company's plantations have given up going barefoot since specially made rubber sandals have been offered to them at 50c a pair. Produced in lively blue, red and yellow colors, the sandals

are widely accepted and have helped curb foot injuries and diseases common among workers on rubber plantations. Machinery for making the sandals has been installed on the plantations and is operated by the Liberians. The model above is shown wearing a pair of the rubber sandals.

Buys Interest In Auto-Lite

Directors of Mergenthaler Linotype Co., Brooklyn, N. Y., have announced the acquisition of substantial interests in the Electric Auto-Lite Co., Toledo, Ohio, and in the Radiation Electronic Corp., a newly formed, advanced electronic research organization of Chicago, Ill. The amount of participation in these enterprises was not announced, but the board indicated that it was not as great as 10 per cent in either case. At the last reporting date, there were 1,600,990 shares of Electric Auto-Lite outstanding. Electric Auto-Lite closed on April 26 at 39⅝, thus a 10 per cent interest would be worth about $6,340,000. A Wall Street report, noting the recent activity in both Electric Auto-Lite and Mergenthaler, had set the amount of the purchase at $3,500,000.

Revise Paracril Grade Code

Naugatuck Chemical Division of the U. S. Rubber Co., Naugatuck, Conn., has announced that it has revised the grade identification system for Paracril products. Previously, Paracril grades had been identified by the use of colored end tapes and/or colored stripes on the face of the bag. With the growth of the Paracril line, this system became unwieldy. The color code has been eliminated and in the future grade designation will be printed or stenciled on the face and on each side of the bag.

Two Join Bristol Manufacturing

Bristol Manufacturing Corp., Bristol, R. I., has announced the appointment of S. V. Gianola to the Research and Development Department and Alfred B. Lingley as advisor to the president on work layouts and methods. Mr. Gianola was formerly president of Techno Efficiency Council, Inc., Thermowear, Inc., and Thermoboot, Inc. He will continue his association with these organizations as a member of the board of directors. Well known in military circles for his research in the field of arctic gear, Mr. Gianola is the recipient of the Navy's highest civilian honor, the Distinguished Civilian Service Award. He was formerly director of Research and Development for the U. S. Navy Supply Activities. Mr. Gianola was appointed to help the company continue to enlarge its scientific facilities so that it can include a greater coordination of its development with urgent military requirements. Mr. Lingley has been associated with the rubber field since 1920. For more than thirty years, he has held executive positions with Phillips Baker Rubber Co. and the Goodyear Footwear Corp., of Providence, R. I., and the Kleistone Rubber Co., Warren, R. I.

Goodyear Promotions Announced

John Platner, E. W. Scott and J. P. Talley have been promoted to new posts by the Chemical Division of the Goodyear Tire & Rubber Co., Akron, Ohio. Mr. Platner has been appointed assistant manager of the Coatings Department, succeeding G. H. Campbell, who was recently transferred to the Goodyear International Corp. Associated with the company since 1947, Mr. Platner has been coating department representative specializing in the styrene-butadiene resins and latices, marketed under the Pliolite trade mark, for the last four years. Mr. Scott, formerly sales service representative for specialty coatings, has been named manager of sales development for the department. This newly created unit has been formed to expedite the introduction of new coating materials for the paper, paint and textile industries. Mr. Scott joined Goodyear in 1954 and has more than 13 years' experience in the formulation and development of coatings for the paper and textile industries. Mr. Talley will take over the sales service position formerly held by Mr. Platner. Prior to his appointment, he was a development engineer in the Chemical Division laboratories. Mr. Talley also joined Goodyear in 1954.

Hi-Sil 233 Price Reduced

Columbia-Southern Chemical Corp. has announced a more than 11% reduction in the price of "Hi-Sil 233", the company's reinforcing silica filler. When first introduced in 1948, the material sold for 15 cents a pound. The present reduction lowers the carload price from nine to eight cents a pound, or nearly half its cost nine years ago. Price reductions have been due to constantly increasing sales volume and lowered plant operating costs, company officials state.

QM Advisory Groups Meet

A joint meeting of the Quartermaster Corps Industry Advisory Committee on Lightweight Cotton and Synthetic Fabrics and Coated Fabrics was held at the Quartermaster Research and Development Center, Natick, Mass., on April 17, 1957. Representatives from the textile and coated fabrics industries were in attendance. Jean L. Lewis presided as government officer. Dr. A. W. Harvey extended official welcome to the group. The committees were requested to offer their advice and recommendations on: (1) The advisability of dividing Specification MIL-P-3003 for the Poncho, Lightweight, with Hood into separate specifications for the coated fabric and the poncho; (2) The elimination of specific description and physical requirements for the nylon fabric used in the poncho and the preferability of having the fabric coater cite his requirements for the nylon fabric in order to ensure his compliance with the physical requirements specified for the coated fabric.

Also, (3) Proposed revised physical test requirements and the inclusion of a classification of defects and acceptance quality level for physical test requirements and the effect that these revised requirements and the Acceptance Quality Level are likely to have on the quality of the poncho, and (4) The ability of industry to consistently meet the requirements of the proposed specification in mass production. Constructive recommendations were made by the industry representatives particularly for simplifying requirements and improving uniformity of production. These recommendations are being considered for possible incorporation in the proposed specification prior to its publication.

Carbide & Carbon Promotes Three

Three promotions at the Institute, West Va., plant of the Carbide and Carbon Chemicals Co. were recently announced. J. H. Field has been appointed area supervisor of the polyethylene area. D. P. Heath and P. W. Pontius have been appointed department heads in the polyethylene area. Mr. Field joined Carbide in 1946 after receiving a B. E. degree in chemical engineering from Yale University. Prior to his promotion, Mr. Field was a department head at Carbide's South Charleston, West Va. plant. Mr. Heath, a graduate of Rose Polytechnic Institute with a B. S. degree in mechanical engineering, came to Carbide in 1946. Prior to his promotion, Mr. Heath was a technical assistant in the polyethylene pilot plant at Carbide's South Charleston plant. Mr. Pontius joined Carbide in 1948 after receiving a B. S. degree in chemical engineering from Iowa State College. Prior to his promotion, Mr. Pontius was a technical assistant in the Butanol Department at the Institute plant.

Berea Plans $200,000 Addition

Berea Rubber Co., Berea, Ky., has announced that a $200,000 addition to the plant will be constructed this spring, with completion expected by July 1. The firm manufactures rubber rings used in aircraft hydraulic systems.

Appoints New Staff Members

William R. Clingenpeel

William R. Clingenpeel has been named assistant chief engineer in charge of rubber and rubber products, product and process development for the Central Battery Engineering Division of the Electric Auto-Lite Co., Toledo, Ohio. Several other new appointments have also been made as a part of the company's current emphasis on, and expansion of, engineering research and product development. Joseph L. Rooney has been named chief engineer of Central Battery Engineering succeeding George L. Kyle, who is retiring. John L. Lander has been appointed manager of basic battery research. Samuel L. Ford, Roger L. Bennett and Raymond C. Haefner were appointed assistant chief engineers, along with Mr. Clingenpeel, within the Battery Engineering Division in charge of research and development functions of the division.

Before he joined Auto-Lite in 1947, Mr. Clingenpeel was a process engineer for five years in the battery industry. In his new post, he will direct work in rubber and rubber products, product and process development. Mr. Rooney joined Auto-Lite in 1946 following four years' service with the U. S. Army during World War II. Mr. Lander, who joined Auto-Lite a year ago, was for nine years a research chemist with the Naval Research Laboratory at the company's Owosso, Mich, battery plant and is now in charge of product control and development in the Central Battery Engineering Division at Toledo. Mr. Bennett joined Auto-Lite in 1945 and will be in charge of product design in the Battery Engineering Division. Mr. Haefner has been with Electric Auto-Lite since 1935. He will direct the commercial engineering and customer engineering contact functions of the Battery Division.

Acquires Vinyl Foam Patents

Patents and experimental equipment in the vinyl foam field formerly held by the Elastomer Chemical Corp. of Newark, N. J., have been acquired by the Union Carbide and Carbon Corp. of New York, N. Y. For the past few years, Union Carbide has been doing considerable development work on the basic resins for making vinyl foam and other foamed plastics.

Naugatuck Chemical Expanding

Naugatuck Chemical Division of the U. S. Rubber Co., has announced the completion of one expansion program and the start of another. Cost of both programs will total more than $9 million. Production of Paracril has been increased 60 per cent at the division's Baton Rouge, La., plant at a cost of approximately $2 million. In addition, foundations have been laid, and steel will soon rise, for a new chemical plant on a 150-acre site in the Scotts Bluff area of Baton Rouge. Scheduled to be completed in December, this plant will require a total investment of more than $7 million. It will be used to make Kralastic plastic materials employed in pipe, automotive parts and many industrial products. The new plant will triple Naugatuck Chemical's production capacity for Kralastic. It will also give Naugatuck the capacity to make more than 60 million pounds of plastic and synthetic rubber yearly in Baton Rouge.

The Paracril expansion was accomplished by adding new equipment and modifying existing units at the Baton Rouge plant. The new Kralastic plant, expected to employ about 125 persons, is being built on land bought by the company in 1956. It will have several buildings, including production, laboratory and office units. The main raw materials for the plastic-butadiene, styrene and acrylonitrile—will be shipped into the new plant from the nearby area by tank car and truck. Shipments from the plant will be by rail, water and truck.

Stockholders Approve Merger

Stockholders of Commercial Solvents Corp. voted at their annual meeting in Baltimore, Md., to merge with Thermatomic Carbon Corp. The merger, which provides for an exchange of 18 shares of Commercial Solvents stock for each share of Thermatomic, was ratified by Thermatomic stockholders at an earlier meeting. Commercial holds a 68% interest in Thermatomic. J. Albert Wood, Commercial president, said preliminary reports for the first quarter indicate the company's industrial chemical sales are running ahead of last year's record high. Biochemical operations also appear to be increasing, he said. However, he added, sales of agricultural chemicals continue to reflect soft market conditions resulting from price reductions last year along with an increase in freight rates and distribution costs. Mr. Wood reported that the company's $10 million plant expansion program, started last year, will be completed on schedule during the final half of 1957.

Expands Michigan Plant

The Niles, Mich., plant of the National-Standard Co. will have more than 400,000 square feet of manufacturing space with the completion by July 1 of a new 16,000 square foot addition. A one-story steel frame structure joined to the existing buildings, the addition will have a 100-foot clear span and be 160 feet long. A 22,000 square foot addition to the plant was completed last year.

Canadian News

H. K. Porter Co., Inc., New York, N.Y., has announced the acquisition of the Federal Wire & Cable Co., Ltd., Guelph, Ont., according to a statement by T. M. Evans, Porter's chairman. Acquisition of Canada's fourth largest wire and cable concern was made by H. K. Porter Co. (Canada) Ltd., a wholly-owned Porter subsidiary. Federal products include cable for the aluminum, aircraft, automotive and electrical industries. Wire is manufactured for the appliance, building, radio and telephonic industries. Among other products are automotive and special harness assemblies to customer requirements.

Harold F. Nunn, vice-president and general manager of Porter's Canadian organization, will move his headquarters from Toronto to Guelph to supervise the new operation. He will continue to supervise Porter's other Canadian business, the Henry Disston Division, with plants in Toronto and Vancouver, and sales representation for several Porter divisions in the United States.

J. Godfrey Smith, founder and president of Federal, will retire but will be available to the new Porter division for consultation. His son, Thomas G. Smith, has been named Federal's general sales manager. He has been head of western sales for Federal and assistant to the general manager for several years. He formerly was with Canadian General Electric.

Both the plant and head offices of Federal are located in Guelph; sales offices are in St. John's (Newfoundland), Truro, Montreal, Winnipeg, Regina, Saskatoon, Calgary, Edmonton, and Vancouver. A new warehouse recently has been opened in Montreal.

Polymer Corp., in its annual report released recently, stated that 1956 production and sales rose to the highest levels in the company's history. President J. D. Barrington stated that production of Rubber increased by 11 per cent to a new total of 268 million pounds and that gross income climbed by 16 per cent to reach $71.5 million. Polymer earned a net income of $9.4 million after provision of $4.8 million for depreciation and $8.4 million for income tax. Dividends of $3 per share were paid out of net earnings of $4.73 per share. Nearly $7 million was spent for additions to plant and equipment during 1956. Greatest emphasis was given to the installation of equipment to increase production, particularly in the butyl and copolymer plants. A new turbo-generator installation was completed and placed into operation in 1956.

There was a strong demand for Polysar products in the world rubber markets during 1956. Four new rubber types were introduced to meet specific customer requirements. Sales of styrene and ethylene were continued.

Mr. Barrington predicted a year of full production for 1957 and a continued high demand level for Polymer products. He also anticipates that Polymer could benefit materially through the utilization of butane supplies in Alberta to produce butadiene. In 1957, it is planned to build a latex plant, which will enable Polymer to meet a growing market for rubber latices, such as the types used for foam rubber.

H. Greville Smith, president of Canadian Industries, Ltd., has been nominated to the presidency of the Society of the Chemical Industry. Mr. Smith will succeed Julian Leonard of London, England, at the 76th annual meeting of the International Scientific Society in Leeds next July and will preside at the 1958 meetings in Canada. Last Canadian president was Victor Bartram of Montreal, who held the position in 1938.

The society was founded in 1881 and numbers more than 7,000 members, mainly concentrated in Great Britain, the United States and Canada, with European and other Commonwealth countries represented. The 77th annual meeting is set for September, 1958, and is the third meeting to be held in Canada. Main business and technical meetings will be held in Montreal. A plans committee is studying the possibility of plant tours in Quebec and Ontario and the U. S. section of the society is planning to award its annual Chemistry Industry Medal during a meeting in Toronto.

DuPont of Canada has announced that it will spend more than $7,500,000 at its Kingston and Maitland, Ont., nylon plants over the next year. The expansions are being undertaken, the announcement said, "to keep ahead of the anticipated heavy demand for nylon yarn by Canadian manufacturers of truck and passenger car tire cord fabrics.

"The expected demand stems, in turn, from price reductions, ranging from 4½ to 12 per cent in the price of nylon cord tires recently announced by Canadian tire companies." Installation of new heavy denier equipment at Kingston, the announcement added, will release facilities now turning out tire cord yarns, and these will be converted to production of yarn and staple fibre for the apparel and other segments of the textile industry.

Polymer Corp. has announced several revisions in its scholarship program for 1957, including the addition of a $1,000 award. The new scholarship will provide $1,000 a year for four years to a Grade 13 graduate in Lambton County. Candidates must have taken five mathematics and science options and must choose a university course in engineering or honors science.

Polymer is again providing a $750 scholarship at the Ontario College of Education for a university graduate who wishes to train as a secondary school teacher of mathematics or science. Two scholarships, each valued at $1,000 a year for four years, are also being provided again for families of employees.

According to current reports, Canadian tire dealers have asked for a government study to see if direct selling by manufacturers could imperil the national economy. After a recent two-day convention in Toronto, the Canadian Tire Dealers and Retreaders Association announced it was going to seek the support of chambers of commerce in requesting the investigation.

A resolution passed at the convention declared that tire dealers were facing an almost impossible situation because manufacturers were encroaching unfairly on their markets and offering unmatchable discounts. This competition from manufacturers was said in some cases to be "unfair and unethical" and a cause of some dealers' inability to remain in business.

M. L. Snyder & Son has announced the completion of a new addition to the company's Woodbridge Rubber Works at Woodbridge, Ont. This facility produces a line of dipped rubber gloves, neoprene waterproof clothing, balloons, drug sundries, tubing, etc. While the company is still operating its Toronto facility, it plans to transfer most operations and personnel to Woodbridge by next year. At that time, the Toronto installation will probably find use as a factory branch.

Miner Rubber Co., Granby, Que., has shut down its factory for a one-month period which started April 8, leaving nearly 800 employees jobless. A company spokesman said over-production was the cause of the shutdown. Sales had dropped as a result of good weather, credit restrictions and rubber imports.

Thermoid Announces Promotions

Thermoid Co., Trenton, N. J., has announced the promotion of Joseph E. Cox from vice-president and general manager of the Essex Rubber Division to executive vice-president. Arthur C. Grimley will succeed Mr. Cox as general manager at Essex. In his new capacity, Mr. Cox will be responsible for all Trenton plant, division and subsidiary operations. A veteran of 32 years in the rubber industry, Mr. Cox was formerly associated with the Goodyear Tire & Rubber Co. He joined Essex in 1946 and was elected vice-president and general manager there in 1956. Mr. Grimley, who was formerly with the U. S. Rubber Co. and the Rubber Manufacturers' Association, joined Essex in 1936. During World War II, he was an adviser to the Office of Price Administration, War Production Board and War Surplus Administration.

Like to make a suggestion to the industry? Write a letter to the editor! (See page 204).

Named Research Supervisor

Dr. Carroll Karkalits

Dr. Carroll Karkalits has been named supervisor of research for the Petro-Tex Chemical Corp., Houston, Texas. Dr. Karkalits was graduated from the Rice Institute in 1938 with a B.S. degree in chemical engineering and took his graduate degree of M.S. and Ph.D. at the University of Michigan. During World War II, he taught Army and Navy specialized training units and later was instructor in chemical engineering at the University of Michigan. Subsequently, for eight years Dr. Karkalits was group leader in the Process Development Department of the American Cyanamid Co. at Bound Brook, N. J. Just prior to joining Petro-Tex, he was supervisor of economic and process appraisal in the Central Research Laboratories of the Food Machinery and Chemical Corp. at Princeton, N. J. Petro-Tex Chemical, jointly owned by the Tennessee Gas Transmission Co. and the Food Machinery and Chemical Corp., operates the nation's second largest butadiene plant at Houston and is currently completing a modern new research laboratory and pilot plant at its Houston headquarters.

210 Super Rayflex Tire Cord

American Viscose Corp., Philadelphia, Penna., has announced that a new super-strength tire cord, formed from a special viscose rayon formula has completed more than a year of consumer highway use with outstanding results in tire safety mileage. The new rayon cord called "210 Super Rayflex", is said to hold its strength and shape even at the highest tire operating temperatures. According to the company, tests have proved that this material withstands severe road shock and offers outstanding comfort advantages over other cords as it prevents tires from forming flat spots when the car is not moving. Described as "pound for pound as strong as steel", the new type of rayon cord material is in production at five rayon companies in this country.

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West Coast News

Kirkhill Rubber Co. of Berea, Calif., has announced the completion of a 3,000 square foot addition to its plant. The new wing will house the department which fabricates canopy seals for aircraft, and will permit an expansion of the duct manufacturing unit. The Kirkhill plant now has 200,000 square feet of ground floor area.

Minnesota Rubber & Gasket Co. of Minneapolis, Minn., has announced the appointment of C. E. Deardorff as manager of its new California sales office at 18633 Ventura Blvd., Tarzana, Calif. Mr. Deardorff will be responsible for activities of all the company's divisions, covering the California area.

Douglas Gray, formerly associated with the National Seal Division of Federal Mogul Bearings, Redwood City, Calif., has joined the Arrowhead Rubber Division at Downey, Calif., as chief chemist.

Joe Kerley has announced the formation of a new rubber company, Sanfarrel, Inc., operating at 1008 Petrolia Avenue in Compton, Calif.

Art Ireland has joined the Pittman Products Co., Huntington Park, Calif.

The Swimaster Division of the Pacific Moulded Products Co., Los Angeles, Calif., has acquired all manufacturing and sales rights to the well-known cartridge-inflating "Lifeguard" re-usable life preserver. The unit is a compact, lightweight life preserver which is worn like a belt or fastened to clothing. It inflates instantly with a squeeze of the hand and will safely support a 250 pound man for many hours.

National Polychemicals Adds Two

National Polychemicals, Inc., Wilmington, Mass., has announced the appointment of Ernest A. Swanson as production manager. Mr. Swanson has been placed in charge of plant operations. A graduate of St. Mary's College, Mr. Swanson had been associated with Westvaco Mineral Products Division, Food Machinery and Chemical Corp. Previously, he had been a research engineer at the Wisconsin Alumni Research Foundation. At the same time Joseph P. Flannery, a graduate of Lowell Technological Institute and Harvard Business School, was appointed purchasing agent. Before coming to National Polychemicals, Mr. Flannery had been with the Kendall Co. and the Plastics Division of the Monsanto Chemical Co. National Polychemicals, formed in 1952, manufactures organic chemicals for the rubber plastics and related industries at its 60-acre Wilmington plant site just 15 miles north of Boston. The firm is contemplating an expansion of its manufacturing facilities during the coming year.

Triggs Receives New Post

F. Joseph Triggs, Jr.

Appointment of F. Joseph Triggs, Jr., to the Philadelphia, Penna., office of the Chemical Division of the Goodyear Tire and Rubber Co. has been announced by C. O. McNeer, general sales manager of the division. For the past 15 months, Mr. Triggs has been training in the Rubber and Rubber Chemicals Department of the Chemical Division. During this time, he received specialized sales training in connection with Plioflex and Chemigum synthetic rubbers, Pliolite reinforcing resins and Wing chemicals. With headquarters in Philadelphia, Mr. Triggs will service rubber processing companies in the Mid-Atlantic states. Mr. Triggs was graduated from Rutgers University with a bachelor of science degree and is a member of the Rubber Division of A.C.S.

To Build Sargent-Designed Dryers

Four large Sargent-designed rubber dryers will be built for the new International Synthetic Rubber Co. plant in Fagley, Haunts, England, by L. A. Mitchell, Ltd., Manchester, England, under a recently signed license agreement between Sargent and the English firm. The new rubber dryers, designed by C. G. Sargent's Sons Corp., Graniteville, Mass., are of the latest type and are expected to be in operation early in 1958. L. A. Mitchell, Ltd., manufactures special dryers and textile equipment. Under the license agreement, there will be a free exchange of engineering data between Mitchell and Sargent. Mitchell will build Sargent equipment for distribution in England and Europe.

Win Public Interest Award

Firestone Tire & Rubber Co. and the B. F. Goodrich Co. were among the recipients of the National Safety Council's 1956 Public Interest Award. The advertising campaigns of the two companies were cited by the council for exceptional service to safety. The rubber companies contributed time and space in many advertising media for the promotion of accident prevention. Contributions included radio and television spot announcements, newspaper and magazine advertising and the promotion of a safe driving league.

Obituaries

Arthur M. Neal

Arthur M. Neal, secretary of the Division of Rubber Chemistry, A.C.S., and assistant director of the Elastomers Laboratory, E. I. du Pont de Nemours & Co., Inc., died at his home in Wilmington, Del., on April 18. Born in West Boylston,

Mass., on July 11, 1902, Dr. Neal received his A.B. and M.A. degrees from Clark University in 1923 and 1924, respectively. He received his Ph.D. in chemistry from Brown University in 1927. After graduation, he worked for the Grasselli Chemical Co. for a short time and joined DuPont as a research chemist at the Jackson Laboratory in 1929. In 1938, he was named acting division head of the laboratory and in 1942 he was appointed assistant director of the company's rubber laboratory, now the Elastomers Laboratory.

Dr. Neal was recognized as an authority on rubber technology in general and specifically on organic antioxidants, antiozonants, peptizers, and accelerators for natural and synthetic rubber. A holder of 37 patents on rubber chemicals and isocyanates, Dr. Neal wrote 15 articles for technical journals on elastomers and related chemicals. He authored the chapter on neoprene in the monograph on synthetic rubber edited by G. S. Whitby which was published under the auspices of the Division of Rubber Chemistry. In the monograph "Chemistry and Technology of Rubber," the authors, Davis and Blake, referred to Dr. Neal's work 19 times. Dr. Neal wrote many DuPont technical bulletins on elastomers and rubber chemicals.

In addition to serving as secretary of the Division of Rubber Chemistry, Dr. Neal also served as A.C.S. Councillor representing the division of the governing board of the parent society from 1949 until his death. He was a member and secretary of the standing committee of A.C.S. on national meetings and divisional activities. From 1946 to 1948 he served as a director of the Division of Rubber Chemistry. Dr. Neal was a member of Lambda Chi Alpha and Sigma Xi fraternities. He was an active member of the Second Baptist Church in Wilmington and was serving on its board of trustees at the time of his death. Funeral services were held in Wilmington on April 22. He is survived by his widow and one son.

J. Fred Schott

J. Fred Schott, development manager of the Footwear and General Products Division of the U. S. Rubber Co., from January, 1954, to March, 1957, died suddenly of a heart attack at his home in Mishawaka, Ind., on April 4. Mr. Schott had been on leave of absence from the company because of ill health. He had over forty years of service with U. S. Rubber, starting in development work at the Mishawaka plant in January, 1917. In 1939, Mr. Schott was named director of the division's development laboratories, located at the Mishawaka plant. In 1954, he was appointed development manager of the Footwear and General Products Division. Surviving are his widow and four children.

Clarence S. Pope

Clarence Sherwood Pope, general sales manager of Gutta Percha and Rubber, Ltd., Toronto, Ont., Canada, died recently at his home in Toronto. He joined Gutta Percha in 1919 as chief clerk in the Export Department. Mr. Pope later became assistant manager and manager of the department. In 1950, Mr. Pope was appointed assistant sales manager. He was promoted to general sales manager in 1955 and travelled widely throughout the world on behalf of the company.

John F. Fagan

John F. Fagan, production superintendent of the General Tire & Rubber Co. subsidiary in Santiago, Chile, was killed in an automobile accident near Santiago on April 3. He was 41 years old. Mr. Fagan had been in Chile for the past year. Prior to that, he served in Tel Aviv, Israel, for three years. Mr. Fagan attended Indiana State Teachers College and was graduated from the University of Akron. He is survived by his widow and two daughters.

A. F. Larabee

A. F. Larabee, formerly chief engineer of the Pennsylvania Rubber Co. and the Pennsylvania Division of the General Tire & Rubber Co. at Jeannette, Penna., from 1929 until 1953, died on April 1. Prior to 1929, Mr. Larabee had been associated with the Mason Tire & Rubber Co. of Kent, Ohio.

John Gammeter

John R. Gammeter, one of America's great inventors, died on April 25 in Akron, Ohio, at the age of 81. With almost 300 patents to his credit, Mr. Gammeter's ideas are said to have saved the rubber industry and the motoring public many millions of dollars. Mr. Gammeter was born in Akron and at the suggestion of his parents spent three years learning the plumbing trade. He then went to work for the B. F. Goodrich Co. carting scrap rubber about the plant. Within a short time he devised a stopper trimming machine that trimmed more stoppers in an hour than a worker could in an entire day. From that time, until the mid-30's, Mr. Gammeter was actively associated with Goodrich, chiefly in machinery development work and manufacturing improvement.

In 1920, Mr. Gammeter was given a free hand by Goodrich to develop inventions not necessarily of use in the rubber industry. In the next two years, he developed, among other things, a new type of steel cable which is said to have netted him more than $200,000. Mr. Gammeter did not try to build up a personal fortune. His philanthropies are the basis for scores of stories.

Of all his inventions, Mr. Gammeter considered the vacuum box the most important. It was this machine that took the flat carcass of a tire and, through air pressure, forced it into the form of a tire. It became standard equipment in all tire plants. Mr. Gammeter also achieved wide fame in the development of airships during World War I. He had already flown in the first airplane ever seen in Akron, five years after the Wright brothers made their historic flight. He also owned the first radio broadcasting set in the vicinity of Akron.

The hydraulic steam vulcanizer was another first for Mr. Gammeter. He also was more responsible for the modern golf ball than any other man since he developed the system of winding strips of elastic around a hard rubber center. The machine was a great boon to Goodrich and the game of golf. Mr. Gammeter, however, never played the game.

At one time, he operated his own laboratories and for five years was consultant for nine large concerns, including U. S. Rubber and A. G. Spalding. Early in 1940, it was estimated that his income from royalties on inventions was about $80,000 a year.

Funeral services were held on April 27 at the Billow Chapel in Akron, with interment in Glendale Cemetery. Mr. Gammeter is survived by his wife.

W. G. Skelly

W. G. Skelly, chairman of the board of the Skelly Oil Co. and one of the few remaining pioneers of America's oil industry, died on April 11 in Akron, Ohio. He was 78 years old. The one-time Pennsylvania newsboy built the Skelly Oil Co. into one of the great corporations of the nation. Mr. Skelly organized the company in 1919 and ten years later the firm was valued at $85,000,000.

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Overseas

By Comtel-Reuter

London—Dunlop Rubber Co., Ltd., has announced plans to construct a tire plant in Rhodesia to supply the growing markets in the Central African Federation. Construction is scheduled to begin as soon as final arrangements are completed. It is estimated that eighteen months will be necessary to complete the structure. The new facility will produce a complete line of automobile, truck, motor cycle and bicycle tires as well as retreading materials.

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Kuala Lumpur—The sale or fragmentation of rubber estates in Malaya has reached an "alarming stage" according to the All-Malayan Estates Staff Union. The organization is asking the Malayan Planting Employers Association to consider paying compensation to workers for loss of employment as a result of sales of estates.

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The Hague—A spokesman for the Royal Dutch Petroleum Co. has confirmed recent reports that the company is "seriously considering" the construction of a large synthetic rubber plant at Pernis, near Rotterdam. The plant, if built, would be the first of its kind in the Netherlands.

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Singapore—The Singapore Rubber Trade Association has rejected a Japanese proposal that claims against the grading and quality of shipments should be heard in Tokyo. The president of the Association said the arbitration should be conducted in Singapore, but that the Association would be glad to discuss the matter with a Japanese delegation scheduled to visit Singapore shortly.

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Milan—A synthetic rubber plant now being constructed at Ravenna by the Societa Anic is expected to begin operations by the spring of 1958. The company is largely owned by the ENI group. It was also announced that Anic has decided to begin the production of styrol following the completion of arrangements with the Koppers Co.

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Singapore—Mayalan rubber producers are said to be divided into two camps over a reported recommendation by a team of experts from Great Britain that the current rubber research and development cess should be raised from one-half cent per pound to three-quarters of a cent (Malayan). The experts were said to have made the recommendation in order to make natural rubber more competitive with synthetic.

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Amsterdam—Results of the General Tire & Rubber Co. of Holland in 1955-56 were disappointing, according to the annual report. The company had a loss of 1.7 million guilders compared with a loss of 1.8 million the year before. Improvements have been noted, however, in the first quarter of the 1956-57 fiscal year.

Singapore—The Singapore Chamber of Commerce Rubber Association has instructed its members to adopt the International System of Rubber Standards which was accepted by the Rubber Manufacturers Association in New York last February. The Chamber has urged all its members to use the official designations including 36 types and grades. Of these, 24 are described as international grades corresponding to the former RMA grades. Six are described as RMA grades and six as Singapore grades.

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Tokyo—The Japanese Government has approved a plan to set up a semi-official company to produce synthetic rubber in Japan. The Japan Rubber Manufacturers Association estimated that production will start by 1959. The project will cost some 12,380,000,000 yen with the semi-official Japan Development Bank putting up most of the funds. Under present plans, the plans will produce about 30,000 tons of synthetic rubber annually, including 27,000 tons of GR-S type.

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Frankfurt—West German usage of synthetic rubber in 1956 amounted to 34,098 tons, according to the Manufacturers' Association. A total of 152,746 tons of rubber was consumed in West Germany in 1956, including 118,648 tons of natural rubber.

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Kuala Lumpur—Malaya exported 12 million rubber seeds in 1956, enough to plant 30,000 acres, according to the Malayan Controller of Export Commodities. It was said that this high figure was the reason the Malayan Government had banned the export of rubber seeds. The ban was imposed at the beginning of the year to insure that the country had enough seeds for smallholders.

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Paris—French rubber importers are faced with the necessity of stepping up their purchases in Malaya and Indonesia to offset a decline in supplies from Vietnam. Buying in Vietnam has dwindled in the past few months because of foreign exchange considerations which have made shipments to the U. S. more attractive to Vietnamese exporters.

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Kuala Lumpur—The Federation of Rubber Trade Associations of Malaya has decided to send delegates to the unofficial rubber trade talks scheduled to be held in London late in June. It is expected that disputes over grading of rubber will be discussed at the meeting. Malayan exporters are claiming that they have lost much money over "exorbitant" claims by British and European rubber manufacturers.

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London—Britain's two major rayon and synthetic fiber producers, Courtaulds and British Celanese, have announced merger plans. The decision followed discussions which convinced the directors of both companies that a close association would be an advantage to both and in the national interest.

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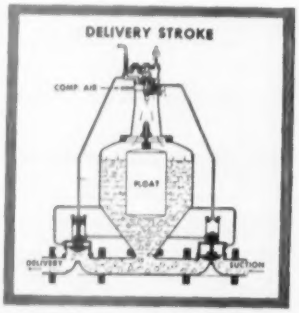

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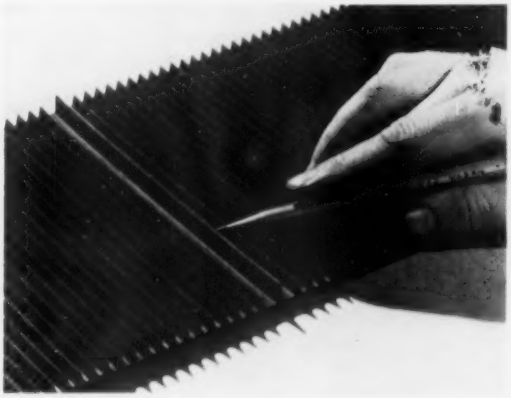
New Goods

Goodrich Griptite Conveyor Belt

B. F. Goodrich Industrial Products Co., Akron, Ohio, has developed a new ribbed package conveyor belt said to carry lightweight packages as firmly as it carries heavy cartons. Called "Griptite," the new belt is especially designed for steep-angle conveyor operations in stores, factories, warehouses and shipping rooms that handle both light and heavy merchandise packages. Packages are held in place by a series of inverted V-shaped ribs that grip the cartons in either incline or decline operations. Extra protection for holding extremely lightweight packages in place is provided by raised ribs or cleats, also inverted V-shaped, spaced 18 inches apart. Standard ribs are ¼-inch high and are spaced four to the inch. The raised ribs, which also help move packages onto the belt, are ⅜-inch high. The ribs are molded with tough, long-wearing, flexible rubber.



The carcass is made of a special lightweight fabric that provides a thin, flexible construction suitable for the small pulley normally used on package conveyor equipment. Incline angle of the Griptite belt depends on the weight, size and surface of the box carried and the type of equipment used. Under certain conditions, the belt may be operated at an angle as high as 45°, the company says. Griptite has no rough surfaces to accumulate dust or dirt and features self-cleaning action. As the belt travels around the pulleys, the ribs fan out and release any spillage that has fallen into the grooves.

Dayton Foam Beach Pillow

Dayton Rubber Co., Dayton, Ohio, has announced that a foam beach pillow with colorful terry cloth zippered covers has been added to the company's Koolfoam bed pillow line. Covers come in an assortment of prints, stripes and solids. The pillow, which is 13 x 17 x 5, takes up hardly any more room than a towel when stuffed into a beach bag, the company claims. It may also be used as an auto back rest or as a comfort item for back seat napping. An open-pore Koolfoam bun surface permits circulation of air through the pillow.

Problem

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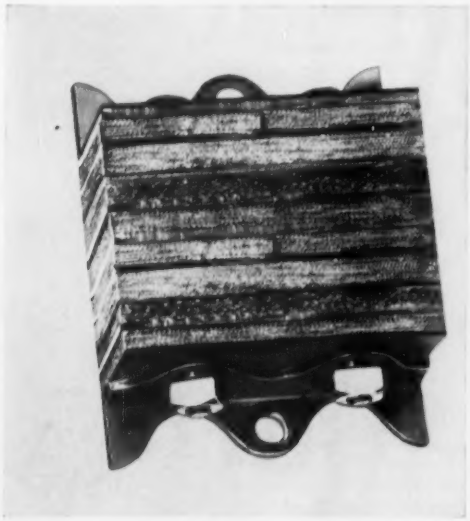
Flex-O-Rubber Truck Bumpers

Bumpers, Inc., 2534 Detroit Ave., Cleveland, Ohio, has introduced rubber-coated fabric truck bumpers, designed for mounting anywhere on a truck body to prevent damage to trucks, buildings and loads. Known as "Flex-O-Rubber Truck Bumpers," the bumpers act as cushioning absorbing the impact of loads. It is believed by truckers and warehousemen that many of the claims



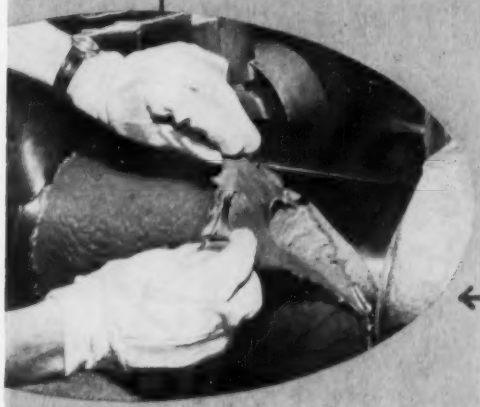
resulting from load damage are traceable to truck-dock impact rather than to actual transportation. The bumpers are constructed with a specially developed rubber-coated fabric which permits reversal of the fabric and doubles the life of the bumper, the company says. Flex-O-Rubber Truck Bumpers are available in three styles specifically designed for truck bed platforms and I. C. C. frames.

Waterproof Sleeping Bag

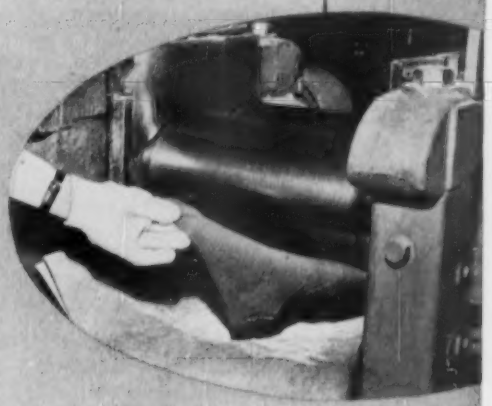
Aldan Rubber Co., Philadelphia, Penna., has announced the introduction of a sleeping bag said to yield greater comfort and protection. Made of strong cotton

fabrics, the bag is finished so that the bottom and canopy are waterproofed, while the top is water repellent. For warmth and softness, the filling is 100 per cent dacron.

WEIGH THE ADVANTAGES OF BARRETT'S NEW A-C† POLYETHYLENE LUBRICANTS



Neoprene stock sticks to mill, must be laboriously scraped off.



Same neoprene formulation with addition of 2 parts per 100 of A-C Polyethylene Lubricant. See how stock rolls smoothly from mill.

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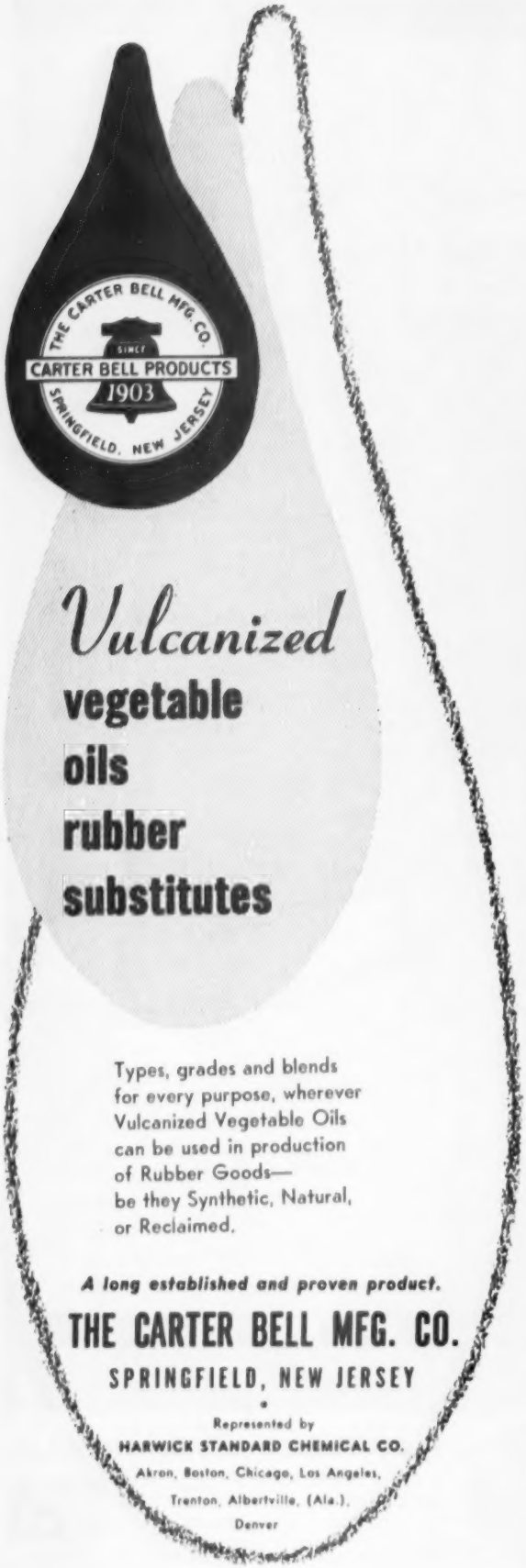
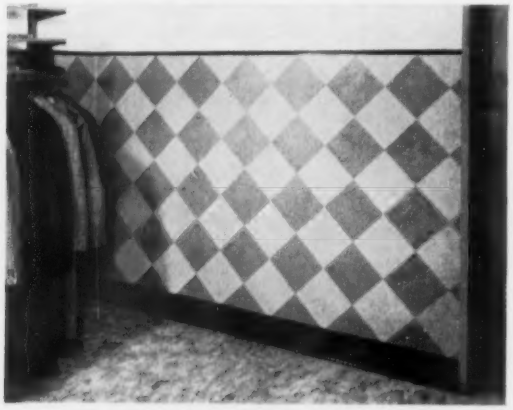


Armstrong Vinyl Wall Tile

Armstrong Cork Co., Lancaster, Penna., has announced the development of a new type of moderately priced vinyl plastic wall covering said to possess the abrasion, fire and soil resistance desirable for industrial installation. Called "Vinyl Wall Tile", the material has a high degree of resistance to soiling, staining, fading, scuffing and moisture effects, the company says. The material is fire-resistant and has been listed under the

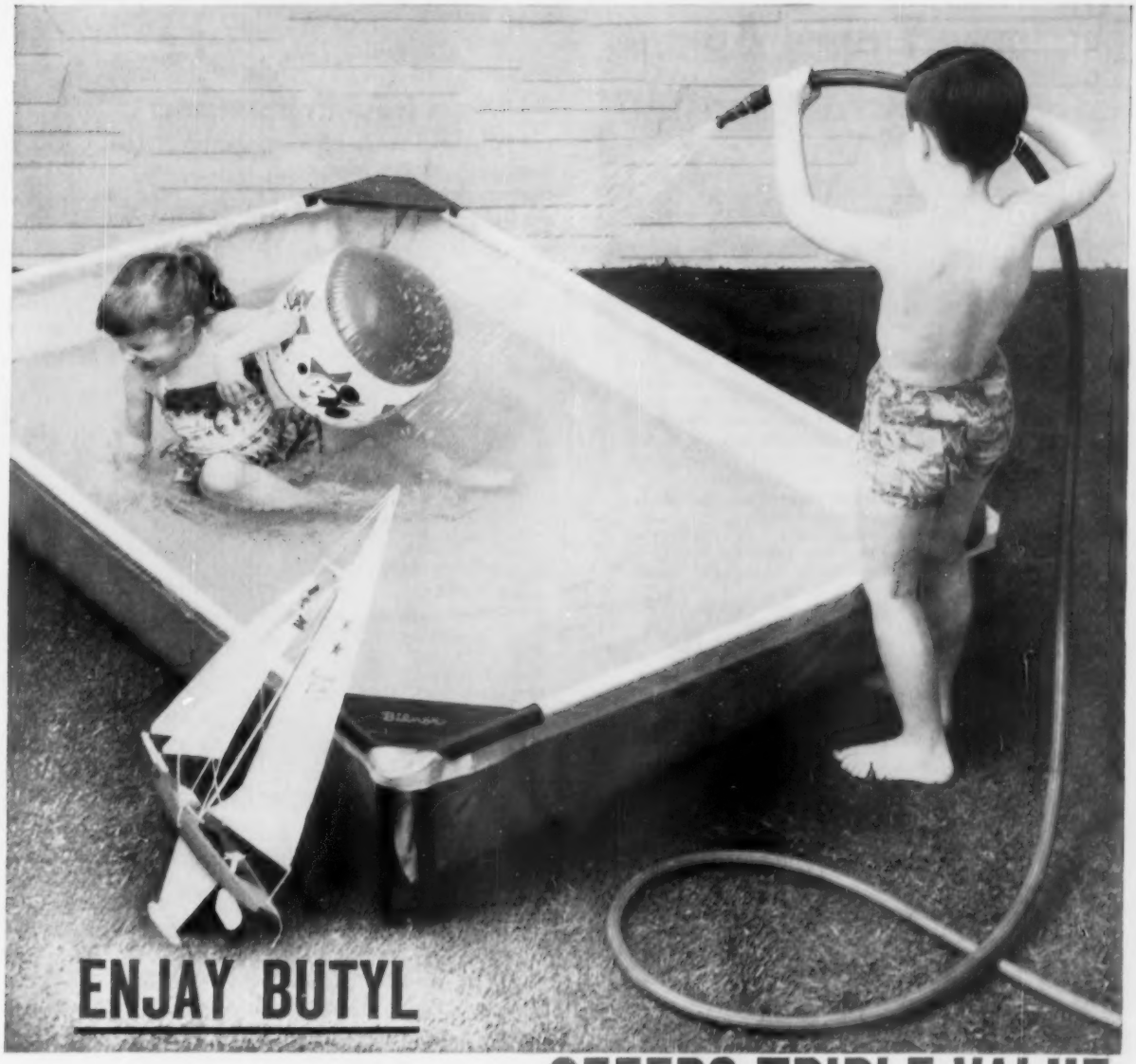


Label Service of Underwriters' Laboratories, Inc., of the National Board of Fire Underwriters. Vinyl Wall Tile is also unharmed by grease and oils, soaps, detergents and alkalis and scratches may be removed by cleaning and rubbing with wax or a cleansing agent. The tile will not discolor with age, the company claims.

Composed of vinyl plastic and asbestos fibers, the product has high dimensional stability and is sufficiently flexible to curve around inside and outside corners. It is applied with an adhesive to almost any firm, smooth base and is easily cut to fit around obstructions. The wall tile may also be formed to sharp angles by heating with a blowtorch. After installation, joint lines are almost indiscernible, the company claims. Currently manufactured in 9 x 9 inch size, it is available in a textured design in nine colors.

Fire-Flex Light Weight Hose

Goodall Rubber Co., Whitehead Road, Trenton, N. J., has announced the production of a new light-weight cotton and dacron fire-hose with a reinforced rubber lining, which has been approved by Factory Mutual Laboratories and Underwriters' Laboratories, Inc. The hose, which was developed in England by the George Angus Co. and is being manufactured by Goodall in this country under license, is said to be lighter in weight, more flexible and yet stronger than conventional fire-hose. A 100 foot length of the hose in 1½ inch inside diameter weighs less than 19 pounds compared with approximately 20 pounds for a 50 foot length of conventional hose. Named "Fire-Flex," the new hose has been used as municipal fire-hose, rack-hose for the protection of buildings, has been dropped from helicopters for use in fighting forest fires and is being widely used for oil exploration and for plant protection in oil refineries, chemical plants and general industry.



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Leatherette Rubber Football

Leatherette, produced by the Aldan Rubber Co., has been used in the production of a football said to be rugged, durable and easy to handle. Manufactured by the Rubber Fabrics Co., the football consists of a coating

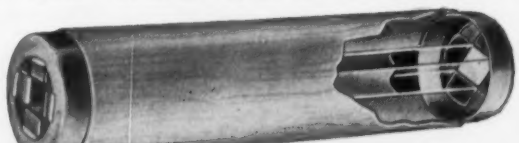
of rubber placed between two layers of cotton and then an embossed rubber coating, which creates the exterior appearance of a professional or varsity collegiate football. The ball-official weight is 115 ounces.

Molded Rubber Cove Base

A molded rubber cove base designed to provide toe space under kitchen cabinets and counter units has been introduced by the B. F. Goodrich Co. The molding has a curved surface in place of a joint or right-angle between the floor and the wall. According to Goodrich, this curved surface eliminates the need to cut down the height of standard four or six inch molding to get a cove turn in toe space areas. Available in four foot lengths, the back of the base is sanded for better adhesion.

Plastisols based on Bakelite vinyl resins are being used to cast the entire interior surface of revolver barrels, enabling laboratory technicians to analyze markings produced by a bullet. This technique finds use in ballistics.

CAP WELD WOODEN SHELLS



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Vacuum Packing Reduces Bag Size

A new type of bagging equipment has solved the problem of loosely filled bags of rubber chemicals that stack poorly. During filling, suction is applied intermittently through the bag walls, thus preforming the bag and removing excess air from the finely dispersed powdered chemicals. When filled, the bag can be sealed immediately and yet has already been compacted to a degree equivalent to that normally reached after shipping and storage. The more compactly filled bags handle easier and require twenty per cent less storage space.

The bagging equipment is manufactured by Carter Engineering Company of Danville, Illinois. First to use this packaging innovation for rubber accelerators is American Cyanamid for their new improved grade of MBTS. The free-flowing characteristics are not affected in any way by this densifying operation and the bags are particularly suitable for unit loading since the flat bag sides interlock neatly and glue together well.

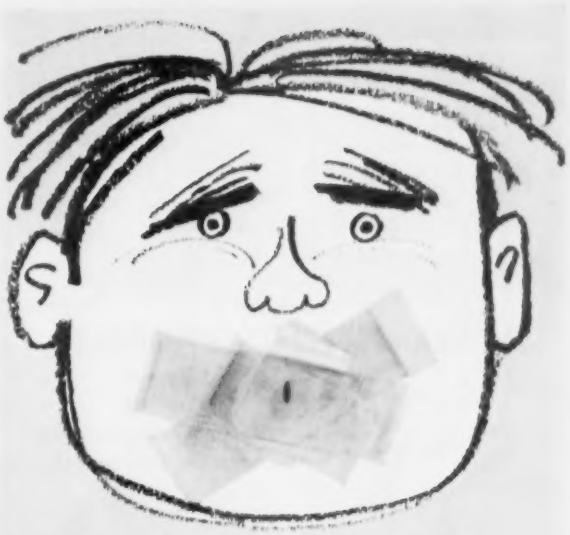
New Bag Shapes

The economical advantages of both unit loading and more efficient use of storage space has brought about a critical re-examination of long established bag dimensions by American Cyanamid Company. The result is a shorter, thicker bag built to Cyanamid specifications by several paper companies. An outstanding characteristic of these bags is a precedent-breaking extra wide gusset of up to 9", providing a package ideally suited for unit loading and storage.

Dimensional considerations that were recognized included the block form of the filled bag for building into a stable interlocked unit, and optimum unit base sizes to provide the greatest ease of loading and unloading in truck bodies. It was also desired to insure a level top layer to allow double tiering at warehouse storage.

American Cyanamid, using these new bag shapes for MBTS and other rubber chemicals, reports that customers are enthusiastic about the saving in storage space, lower handling costs and ease of emptying into compound bins and pans.

Advertisement



CANT TALK (though we'd like to) about the new equipment at Cyanamid's MBTS plant—for the unique processing methods explain why the product is exceptional by previous MBTS standards. But "Production" tells us it's still "trade secret," and we're limited to telling you about the results...

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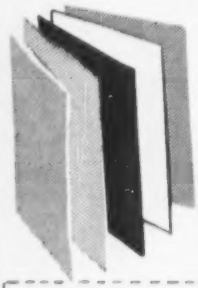

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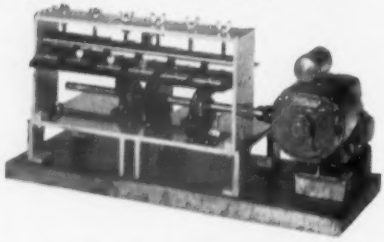

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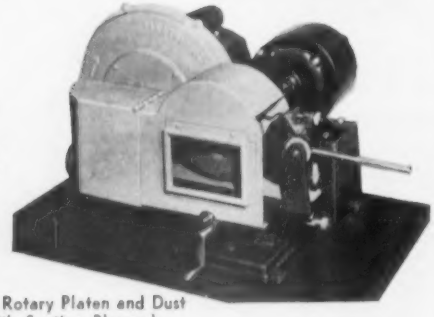

(Shown with Rotary Platen and Dust Collector with Suction Blower.)

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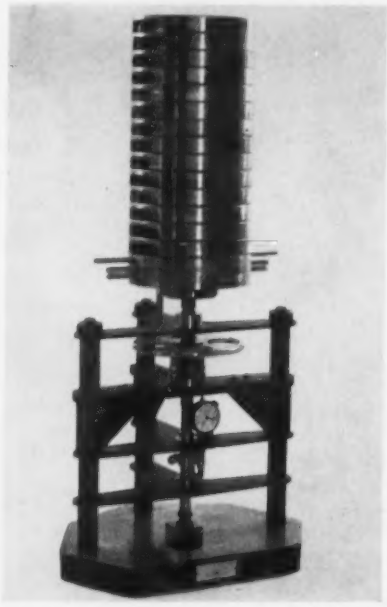
New Equipment

Armstrong Indentation Machine

The Armstrong Indentation Machine, manufactured by Custom Scientific Instruments, Inc., 541 Devon Street, Kearny, N. J., under an agreement with the Armstrong Cork Co., is designed to test the compression and recovery of materials. The instrument is adaptable to a wide range of materials, including gaskets and vinyl floor tile, and gives reproducible results. Two models are available: CS-71LL has a preload weight of one

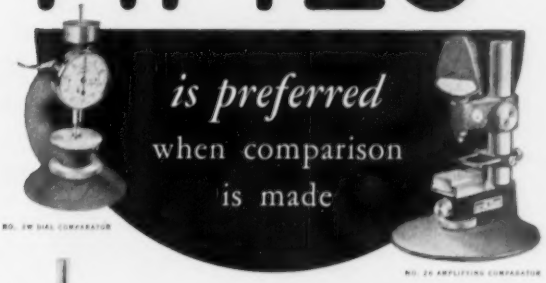


pound and a maximum load of 30 pounds. Model CS-71HL, seen in the accompanying illustration, has a preload weight of one pound and a maximum load of 300 pounds.

The instrument has a smooth base plate for supporting the specimen. The indenting load is transferred from a ball-bearing support to the indenting plunger by means of a screw and handwheel. Also attached to the plunger is an adjustable stop that contacts the spindle of a dial micrometer, which is attached to the frame of the machine and which registers any movement of the plunger. The indenting tool consists of a flat-ended cylindrical steel rod for the heavy load model and a spherical steel ball for the light load model.

The dial micrometer is adjusted to zero with the indenting tool in contact with the base plate so that it registers the thickness of a specimen during the test. To measure the compressed thickness of the sample, the weight rack and handwheel assembly are lowered by means of the handwheel to rest upon the spindle without impact. The compressed thickness may be noted on the dial indicator at equilibrium or at a specified time period. In a like manner, the recovered thickness is noted on the dial indicator after the weight rack and handwheel assembly have been raised from contact with the spindle.

AMEs



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Laminated Products Press

A new 2200-ton water-hydraulic press for the production of all types of laminated products has been introduced by the Birdsboro Steel Foundry & Machine Co., Birdsboro, Penna. The new press expedites loading and unloading and prevents the possibility of damage to the loading plates and steam plates during operation. The new machine is a multiple-opening steam platen press with side plate construction. Side plates are keyed and bolted to the main cylinder and to the top platen. The press is of rigid construction to eliminate sway and minimize deflection.

A multipe-opening elevator attached to the front of the press permits loading every other opening during the pressing cycle. When the press is opened, the operator can unload the pressed product into the elevator and immediately, by advancing the elevator one position, re-load the press from the elevator. This design reduces the time required between pressing cycles and allows the operator ample time to load and unload the elevator during the press cycles.

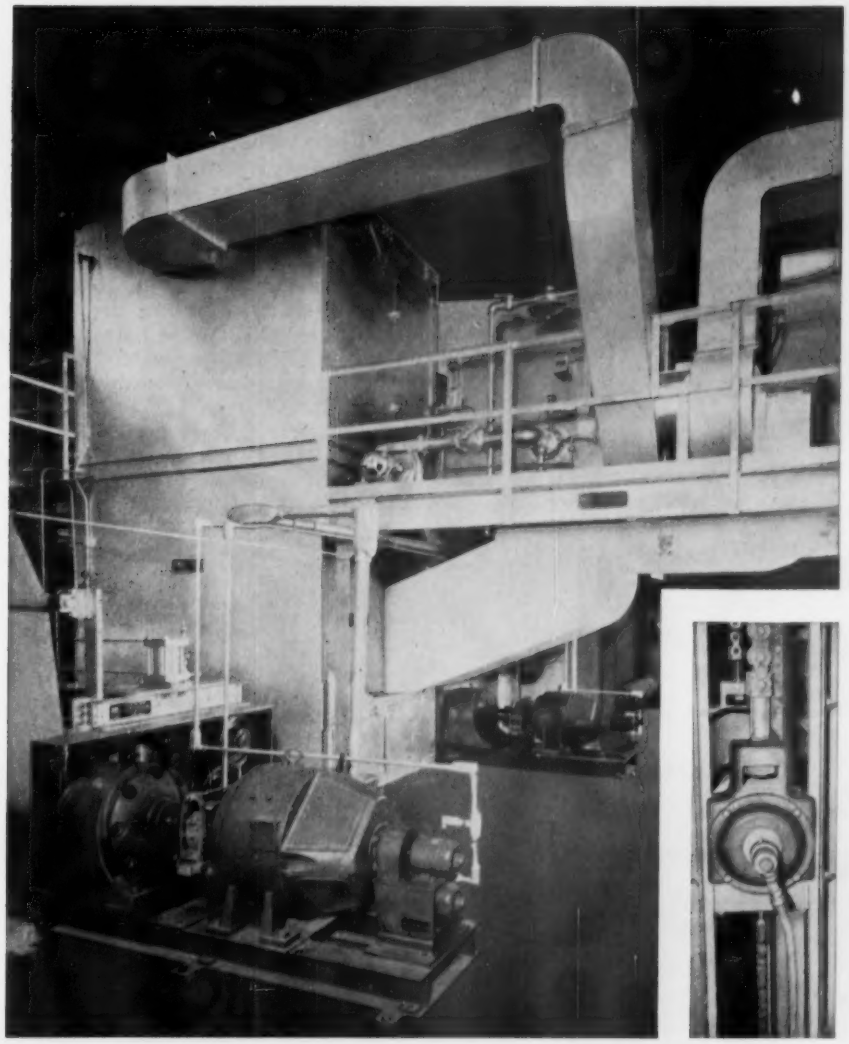
Electronic Temperature Controller

With a differential of $\pm 0.1°F.$ for all ranges, the Model 63 precision electronic temperature controller produced by the Yellow Springs Instrument Co., Inc., Yellow Springs, Ohio, is said to improve the regulation of calibrating baths, ovens, extruders, incubators, press platens, and many other process instruments by providing extremely accurate on-off action. The unit is available in several temperature ranges from $-100°F.$ to $+500°F.$, and can be installed at a distance from the sensing element and grouped in standard conduit boxes for multiple control applications. The power supply is self-contained in each unit, and control action is said to be virtually unaffected by line variations between 105 and 125 volts.

A wide variety of thermistor probes is obtainable for use with the instrument. Over ten types, suitable for gases, liquids and solids, are available. These units range from a 3/16-inch stainless steel tubular spring loaded model to hypodermic needles.

Tape Tension Hand Meter

Tensitron, Inc., Harvard, Mass., has introduced a hand-held meter for use with magnetic tape recorders, which is said to measure tape tension accurately. The instrument can also be used by manufacturers of typewriters, adding machines and users or makers of narrow fabrics, ribbons, carton tape and film. The Tension Meter has a range of 0-1000 grams with great resolution in the range of 0-200 grams. It is used to measure tape transient tension such as is encountered in sudden braking and starting, during coating and other processing operations. Measurements are made by pressing the trigger, inserting the tape and then reading the tension upon release of the trigger. The face of the meter may be read while the tape is running, stopping or accelerating. Tensions as high as 900 grams have been found when no tensions were figured to exist.



Within the first day of startup, full width nylon tire cord processed in this 30-yard-per-minute, 14,000-pound-tension IOI Rollevator® Oven*, was made into aircraft tires meeting all qualification tests.

The Rollevator® roll automatically moves up and down within the oven, in direct relation to line speeds. Thus, at *any line speed, heat-exposure* time of the nylon is held *constant* at a constant temperature setting and at constant tension.

Rollevator® Oven* hot stretches nylon tire cord at constant optimum temperature, constant time and constant tension, at variable line speeds

The IOI Rollevator® Oven* is the answer to more uniform hot stretching of nylon with greater production efficiency. Simple and automatic in operation, it practically eliminates costly shutdown and repair time. When the line is stopped the Rollevator® roll automatically lowers out of the heat zone, eliminating the need for quick cool purging of the oven and the time and expense involved in reheating the oven when starting up again. Its low operating cost combined with low initial cost assures you of lower production cost. An IOI sales engineer will be glad to give you complete information about the Rollevator® Oven* and to discuss your requirements for any system from 3 to 100 yards per minute.

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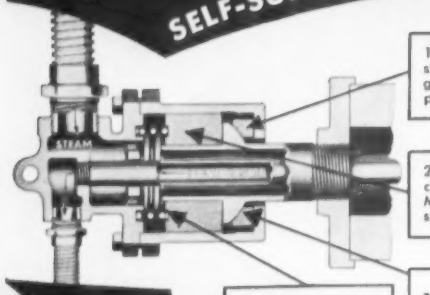

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4. SPRING — For initial seating only. In operation joint is pressure sealed.

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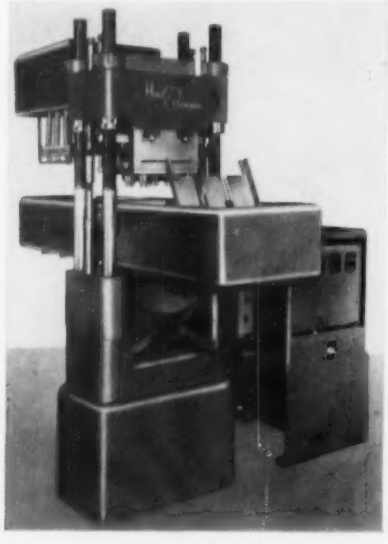
Hull-Standard Automatic Molding Press

A new line of fully automatic, high-speed compression molding presses which feature an all-electric drive, a safety interlock system and a Quickset sequence automatic cycle control was recently introduced by the Hull-Standard Corporation of Abington, Penna. The complete dry cycle time is 12 seconds, not including the "slow close" adjustment, which gives a range of closing speeds to meet plasticizing time requirements of various materials. The 75-ton Model 450-B press has a



closing speed at 2.9 seconds and an opening speed at 2.7 seconds. The die area is 18 by 18¾ inches. Platen stroke is 7 inches.

The Model 450-B is equipped with a flexible feeding mechanism which permits feeding controlled amounts of powder from 1 cubic inch to 2 cubic inches per station for different size mold cavities. The output of several stations can be combined as required to fill larger cavities. The 75-ton model has 16 stations. Smooth take-off of finished parts is provided by a motor-driven reversing carriage. A comb on the carriage slides between knockout pins and receives ejected finished parts which it transfers into a receptacle.

The automatic operation of the press makes it possible for one man to handle as many as ten machines at one time, since he is needed only to refill hoppers and take away containers of finished pieces. If desired, however, the machine may be operated as a semi-automatic press for purposes of trying out and breaking in molds and for production of smaller or sample lots.

The automatic cycle includes filling of mold cavities with accurately measured charges, closing, precision-controlled breathing, curing, opening and ejecting finished pieces into a container. Large molding area and T-slots, accessible and easily adjusted mechanical knockouts, and the Quickset sequence controller permit fast, easy mold set-up. The swinging take-off provides easy access for mold installation. The Quickset cycle control provides fingertip regulation with individual dials controlling each press operation independently. The sequence safety-interlock system shuts down the machine en-

tirely unless each operation is preceded by a successful and complete previous operation. This provides safety to the mold, machine and operator.

The hydraulic toggle action with its high-speed circuit requires only a 3-hp motor, and provides minimum opening and closing time.

New Drape-Flex Stiffness Tester

Sponge rubber, plastic foam, and other extra thick sheet materials can be tested for stiffness on the Model-X Drape-Flex Stiffness Tester announced by Fabric Development Tests, Inc., Post Office Box 45, Brooklyn 32, N. Y. The unit can be used with materials in thicknesses from one-eighth to two inches or more, and in strip lengths up to 14 inches. It is suitable for films, coatings and flexible sheet plastic, which possess intrinsic and

dimensional stiffness and are sensitive to temperature changes. In general, the dimensional stiffness of solid sheet materials increases as the cube of thickness or weight. With coated fabrics or supported films, the stiffness on each side can be measured separately. The manufacturer says also that the simplicity of this operation makes it ideal for testing materials over a wide temperature range. The tester consists essentially of a hollow rectangular stand with a cutout sloped end, a graduated scale on top, and a specimen holder which moves along the top and over the sloped end. The specimen to be tested is placed in the holder on the top surface and moved forward until the free end drops down under its own weight. The length of overhang is read directly from the fixed scale.

Tensitron Tension Meter

A new light weight tension meter for checking tension during the processing of materials has been announced by Tensitron, Inc., Harvard, Mass. The instrument has a range of one to twenty pounds, with great resolution at the low tension end. It features a lever-inserting mechanism whereby two outer rollers are lowered or raised simultaneously. The controlling lever is at the side of the instrument away from the moving material, which protects the operator's hands and keeps the moving material away from the observer at all times. Wide flanges at the bottom of the low-inertia rollers hold the material securely in place while tension is read as the material travels at production speed.

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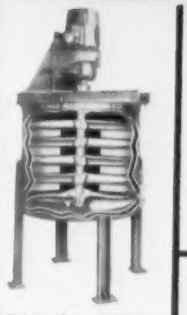
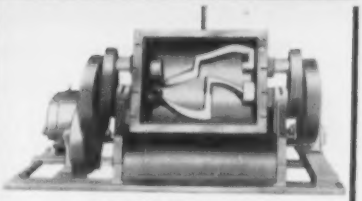
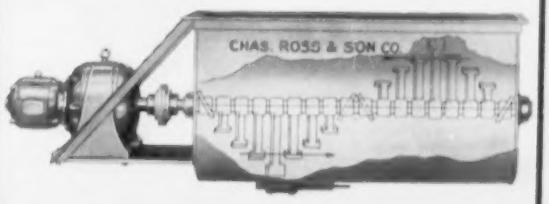


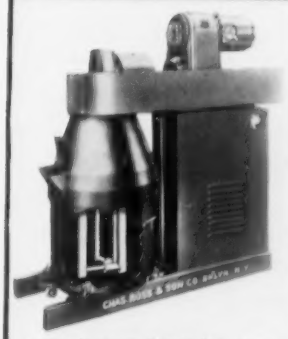
Rubber Cement Mixers
100 - 1000 Gal. sizes



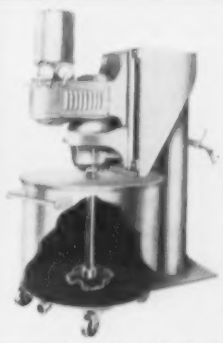
Heavy Duty Double Arm Kneaders
1 pint - 150 Gal. sizes

Rubber Reclaiming Mixers
100 - 1000 Gal. sizes

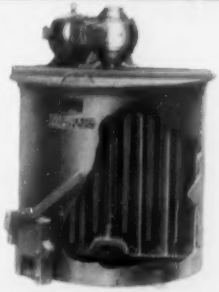




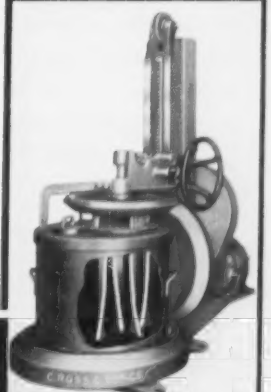
Double Planetary Change Can Mixers
1 - 150 Gal. sizes



High Speed Change Tank Mixers
80 - 250 Gal. sizes



Heavy Duty Paste Mixers
25-1000 Gal. sizes



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Reviews

BOOKS

Methoden der Organischen Chemie "Houben-Weyl" (Methods of Organic Chemistry). (Fourth Edition). Edited by Eugene Müller in cooperation with O. Bayer, H. Meerwein and K. Zeigler. Published by Georg Thieme, Stuttgart, Germany. 20 Volumes; average price $25.00 per volume; 7½ x 10½ in. (In German).

(EDITOR'S NOTE: An over-all review of "Houben-Weyl" appeared in the March, 1957 issue of RUBBER AGE. Reviews of several individual volumes appeared in April, 1957. Herewith are additional reviews of other volumes in the set.)

Volume III: Part 2—By E. Abrahamczik and F. Würstlin (Badische Anilin- und Sodafabrik), W. Degenhard (Carl Zeiss), U. Fritze, H. Hoyer, M. Pestemer and K. Rast (Farbenfabriken Bayer), O. Fuchs (Farbwerke Hoechst), E. Brüche (Physigalisches Laboratorium, Mosbach), R. Brill (Polytechnic Institute of Brooklyn), K. Cruse (Technischen Hochschule Aachen), T. Förster and J. Goubeau (Technischen Hochschule Stuttgart), R. Honerjäger (Universität Berlin), H. J. Antweiler and M. von Stackelberg (Universität Bonn), E. Asmus (Universität Münster), E. Müller (Universität Tübingen), W. Schaaffs (Berlin-Sienemsstadt), H. A. Stuart (Hannover-Mainz), W. Kast (Krefeld) and D. Brück (Leverkusen). 1078 pp. This book deals with electrical, optical, magnetic and acoustic methods. The underlying theories, apparatus and methods of measurements most useful in organic chemistry are presented. The methods presented are conductivity determinations (13 pages), pH determinations (76 pages), indicators (29 pages), potentiometric and conductometric titration (69 pages), electrophoresis (43 pages), electrochemical potentials of organic compounds (36 pages), methods based on polarity (50 pages), methods for determination of dielectric properties (52 pages), refractometry (14 pages), polarimetry (13 pages), light scattering (30 pages), fluorescence and phosphorescence (17 pages), a discussion of methods based on diffraction of electrons (19 pages), electron microscopy (17 pages), X-ray methods (48 pages), absorption spectroscopy in visible and ultraviolet light (167 pages), Raman-spectroscopy (25 pages), infrared spectroscopy (102 pages), microwave spectroscopy (12 pages), magneto-chemical methods (62 pages), and ultrasonics (16 pages). The volume closes with an author index (29 pages) and a subject index (47 pages).

Volume III, Part 1 and Part 2, are two highly welcomed volumes, since they serve to explain to the preparative organic chemist not only the uses but also the theoretical meanings of methods borrowed from physical chemistry. Since physical methods are being used more and more in elucidating the structure of organic compounds, this volume will be found most helpful by the organic chemist who is, as a rule, not too well versed in physical chemistry.

Volume IV, "Allgemeine Chemische Methoden", Part 1, which has not yet appeared, is to deal with oxidation, reduction, anti-oxidation, condensation, photo-chemical reactions and free radicals.

Volume IV: Part 2—By H. Kröper, G. Schiller and K. Wimmer (Badische Anilin- und Sodafabrik), H. Henecka (Farbenfabrik Bayer), J. Krebs and W. Reisner (Röhm and Haas), H. Koch and K. Ziegler (Planck-Institut), W. Theilacker (Technischen Hochschule Hannover), B. Helferich and K. Stetter (Universität Bonn), H. Simon and F. Weygand (Universität Tübingen), G. Hesse (Erlangen) and F. Müller (Goslar). (1955). This part is organized in thirteen chapters. The first chapter, "Säure-Basen-Katalyse" (55 pages), is concerned with the general theory of acid-base catalysis and the use of catalysis in the activation of the

carbon-oxygen bond, multiple carbon-carbon bond, decarboxylation, and activation of nitrogen contained compounds. The second chapter (72 pages) covers catalysis by means of complex cations and anions. The third chapter (98 pages) describes the preparation of catalysts and mixed catalysts. Chapter 4, "Ausführung heterogener katalytischer Reaktionen", is organized in two parts (189 pages). Part 1 is devoted exclusively to heterogeneous catalysis. Part 2 includes homogeneous catalysis which is not acid-base catalyzed. Chapter 5 (17 pages) deals with general methods employed in carrying out pyrochemical reactions. "Elektrochemische Reaktionen" (43 pages) is the subject of Chapter 6.

Chapter 7 (30 pages) describes methods of preparing optically active compounds. Chapter 8 (85 pages) covers the preparation of isotope-containing ("tagged") compounds. Chapter 9 (90 pages) discusses preparation and conversion of large ring systems. Chapter 10 (56 pages) covers methods used in performing biochemical reactions. Chapter 11 (16 pages) discusses the techniques of micro biological-chemical reactions. Chapters 12 and 13 are the author and subject indices, 44 pages and 58 pages respectively. Polymer chemists will find this volume a particularly rich source of information on theories of catalysis and condensation reactions.

Volume VII: Part 1—**Sauerstoff-Verbindungen II.** By O. Bayer (Leverkusen). (1954). The main subjects covered are preparation of aldehydes, conversion of aldehydes, and supplementary hints for aldehyde preparation; the last a brief chapter of 6 pages. The author index (30 pages) and the subject index (22 pages) conclude this volume. The subject index is limited to names of aldehydes and their derivatives. The author refers the reader to the table of contents at the beginning of the book for locating specific reactions. The use of both the subject index and the tables of contents pages for finding material is advisable for all volumes of Houben-Weyl (See comments of this reviewer concerning Volume II). This volume is a comprehensive treatise of the subject "aldehydes". In addition to giving information from published literature (including patents), the author makes available experience and observations made in the laboratories of the former I. G. Farbenindustrie. This volume thus contains original contributions not previously recorded in the literature.

Volume IX—Schwefel-, Selen-, Tellur-Verbindungen. By M. Bögemann, H. Eckoldt, F. Muth, S. Petersen, M. Quaedvlieg and H. Söll (Farbenfabriken Bayer), A. Schöberl and A. Wagner (Tierärztlichen Hochschule Hannover), J. Goerdeler (Universität Bonn), A. Schönberg (University of Cairo), H. Böhme (Universität Marburg), O.-E. Schultz (Universität Tübingen) and H. Rheinboldt (São Paulo, Brazil). (1955). This volume covers the subject of organic sulfur, selenium and tellurium compounds very thoroughly. The section on sulfur compounds comprises 909 pages, the section on selenium and tellurium compounds 281 pages. A brief (3 page) discussion of nomenclature of sulfur compounds concludes the text. The author index occupies 58 pages, and the subject index, 63 pages. Detailed descriptions of procedures are indicated in the subject index by bold face numerals, which is most helpful. Needless to say that this volume, dealing with reaction of organic derivatives of sulfur and its related elements, contains much information of interest to rubber chemists.

F. R.

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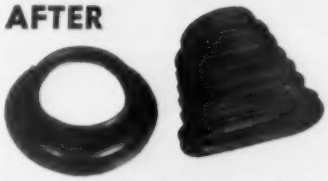

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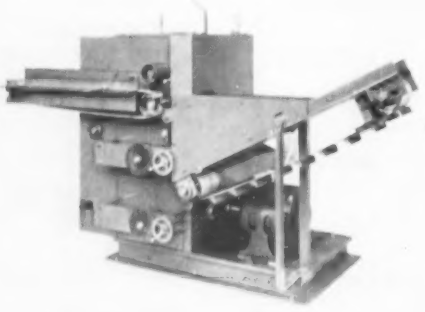

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REVIEWS (CONT'D)

DuPont Elastomers: Neoprene and Hypalon. Elastomer Chemicals Department, E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del. 8½ x 11 in. 16 pp.

Basic information on the properties and applications of neoprene and Hypalon is presented in this colorful booklet. The booklet discusses the manner in which each of the elastomers may be used in the production of a variety of end products. Resistance to chemicals, heat, weather and ozone are stressed in discussing the applicability of the materials. An interesting chart shows how neoprene compares with other elastomers. The booklet will provide a good "briefing" on the properties and capabilities of these two elastomers to those who are not too familiar with them.

•

Process Control Units. (Bulletin No. RC-1). Mayer Refrigerating Engineers, Inc., Lincoln Park 3, N. J. 8½ x 11 in. 4 pp.

This comprehensive brochure describes production line heat transfer systems now being offered by the company. Complete information is furnished on Mayer cooling calender rolls, including one, two and three-roll units incorporating the company's patented "Spra-Blast" for heat transfer. Also discussed are Mayer "Spra-Cool" conveyors covering applications where material is fed to the cooler in sheet or extruded form. The two-color publication also covers "Spra-Blast" cooled tunnels used in installations where the temperature control of process material is essential.

•

Bronoco Solvents. The R. J. Brown Co., 1418 Wittenberg Ave., St. Louis 10, Mo. 8½ x 11 in 57 pp.

Typical properties of representative Bronoco solvents and specialty products of interest to industrial consumers are detailed in this data and specification catalog. The grouping of data has been arranged for greatest convenience, and an index at the front simplifies location of specific items. Suggested applications are listed for each material, and a chart on each outlines physical characteristics. A looseleaf binder permits removal of obsolete pages and substitution of replacement pages. The booklet is divided into two sections on aromatics and aliphatics. A description of rubber solvents produced by the company is included in the latter section.

•

Gurley Testing Instruments. (Bulletin No. 1400). W. & L. E. Gurley, Troy, N. Y. 8½ x 11 in. 20 pp.

Seven instruments are described in this bulletin: the Gurley stiffness tester, R. D. smoothness tester, H-P-S smoothness porosity tester, densometer, permeometer, Gurley-Hill S-P-S tester, and Gurley-Cobb sizing tester. Illustrated with photographs and diagram drawings, the booklet offers a description of each with explanations of their uses and related general information, such as size and weight. The Gurley stiffness tester, for example, measures the flexibility of sheet matrials, such as rubber, plastics or cloth. It can be used for manufacturing control, for testing the effect of chemical treatments, or for research problems.

•

Neoprene Latex Type 635. (Report No. 57-2). By R. O. Becker. Elastomer Chemicals Dept., E. I. du Pont de Nemours & Co., Wilmington, Delaware. 6¼ x 9½ in. 12 pp.

A general description as well as the physical characteristics of Neoprene Latex Type 635, an aqueous colloidal dispersion of a soft, tacky polychloroprene, are given in this report. After a short discussion of general methods of compounding, data are furnished on the use of the latex in gelled dipped goods compounds, as an adhesive binder, in adhesive applications, in adhesives, and in foam. Some information on storage precautions is also included.

Columbian Carbons . . . Beaded for Better Bulk Handling. Columbian Carbon Co., 380 Madison Ave., New York 17, N. Y. 8½ x 11 in. 16 pp.

The basic characteristics of systems for handling carbon black beads efficiently and economically, and the numerous advantages to be gained through the use of such systems, are outlined and described in this booklet. According to data presented, the cost for a hypothetical system to handle 5,000,000 pounds of carbon black per year in four grades is approximately $60,000. This figure includes the pit, belt conveyors, bucket elevator, storage tanks, weighing equipment, drives, tubing, electrical work, etc. Analysis indicates the equipment should pay for itself in 2½ years. The booklet also describes beading processes, bead characteristics, and the tentative ASTM test methods for carbon black.

•

Texas Sympol. Texas-U.S. Chemical Co., 260 Madison Ave., New York 16, N. Y. 8½ x 11 in. 20 pp.

The uses and characteristics of the butadiene-styrene synthetic rubbers manufactured and marketed under the Synpol brand name are conveniently presented in this attractive bulletin. Extensive information on different grades of the three types currently available—hot, cold and oil-extended cold—is provided in both descriptive and tabular form. In each case, the chemical and physical properties of the polymers are listed, with minimum and maximum values given wherever possible. The data covers the three recently improved polymers, i.e., Synpol 1703, 1707 and 1708. Test recipes, from which the physical and chemical properties of the various polymers described were determined, are included.

•

Research at Allis-Chalmers. (Bulletin 48-B-8448). Allis-Chalmers Manufacturing Co., 979 S. 70th St., Milwaukee, Wisc. 9 x 12 in. 24 pp.

Facilities of the Allis-Chalmers Central Research Laboratories are described and illustrated in this booklet. The electrical, mechanical, physics, nuclear, chemical, metallurgical and processing research installations are covered. Photographs of various machines in operation in the different laboratories show the research activities as they are performed, and explanatory captions describe the techniques being employed. Illustration and text present a brief, attractive summary of the methods and processes used by the company's product and design engineers in developing new products.

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Betanox Special. (Compounding Research Report No. 39). By R. R. Barnhart. Naugatuck Chemical Division, U. S. Rubber Co., Naugatuck, Conn. 8½ x 11 in. 8 pp.

The composition, characteristics and applications of Betanox Special, a non-staining amine type antioxidant especially suited for use in automotive and mechanical rubber products used adjacent to lacquered parts as well as in wire insulation and jackets, are covered in this bulletin. The use of the material as a copper deactivator, as an antioxidant and as an antiozonant in various compounds is described. Physicals are shown in each case. The compounding properties of the antioxidant are stressed.

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Dipac versus Other Rubber Accelerators. Industrial Division, Pennsylvania Salt Manufacturing Co., 3 Penn Center Plaza, Philadelphia 2, Penna. 11 x 8½ in. 10 pp.

As indicated by its title, this report compares Dipac, the company's delayed action sulfenamide accelerator, with other rubber accelerators. Data are furnished on a number of compounds, including smoked sheet rubber with ISAF black, GR-S 1500 with HAF black, and GR-S 1712 with ISAF black. The compounds and resulting physicals are shown in each case, along with comment relative to scorch and curing times. The chemical composition and physical properties of Dipac are included.

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MARKET REPORTS

TRENDS
NEWS
PRICES

Natural Rubber

Since our last report (April 1), the price of spot rubber on the New York Commodity Exchange has moved in a range of 100 points, high for the period being 32.75c reached on April 26, and low being 31.75c reached on April 1. The average price of spot rubber for the month of April was 32.23c based on 21 trading days. This compares with an average of 31.76c in the previous month.

Not since late last summer has futures market activity and interest been so confined. Prices also have been limited to remarkably narrow ranges. Aggressive leadership still is lacking on either side in any futures market. Volume has been at the lowest average rate since late last summer.

Open interest is the smallest in many months, and barely a third of what it was as late as December when the last uptrend reached its peak. While prices have been quite indecisive in recent weeks, the impression has been gathered that the line of least resistance has been generally the upside.

Market Near Dead Center

The market seems to be near "dead center," reflecting both the balance between world supply and demand, and some lingering doubts as to consumption. There is very little evidence of speculation anywhere in the world markets.

Foreign markets appear a little less hopeful on higher prices than New York, which has kept a very slight premium over London and Singapore, usually not more than ½c. However, it must be emphasized that even in Singapore, where sentiment has been least confident, there has been little pressure to sell.

The market paid little attention to news that might usually lift or depress it. The shaky Indonesian situation has been almost ignored, even though it seems to reflect in decreased exports from that country. The strike at the B. F. Goodrich Co. apparently did not affect the price structure in any way.

World offtake of late has been of minor proportions. It is known, however, that the level of consumer stocks is much improved since the start of the year. At last reports, natural rubber inventories are approaching normal levels or even below, and it may be that some buildup will soon be in the offing.

European Consumption Rising

It is felt that European consumption rates are on an uptrend after the Suez situation. The indicated offtake by the United Kingdom in the first three months of this year was not as low as had been expected, and this applies to other European countries as well.

Russian buying so far this year has not been of the proportions which boosted the price structure last year. However, Russia has been buying constantly, and from a larger number of dealers. Red China, partly for political reasons, has been a fairly steady buyer at Djakarta. Indonesian and Malayan output is said to be running at a reduced rate, although an uptrend is indicated.

NEW YORK, MAY 1, 1957

Price Data

Closing Rubber Prices on New York Commodity Exchange

FROM APRIL 1 TO APRIL 30

April	Spot	May	July	Sept.	Nov.	Sales
1	31.75	31.65	31.45	31.20	30.90	51
2	31.88	31.85	31.70	31.50	31.15	88
3	32.00	31.85	31.65	31.50	31.20	64
4	32.25	32.20	32.05	31.85	31.55	81
5	31.88	31.75	31.60	31.45	31.15	70
6	....	....	....	....	....	...
7	....	....	....	....	....	...
8	31.88	31.90	31.65	31.45	31.15	106
9	32.00	32.00	31.90	31.65	31.40	137
10	32.25	32.23	32.21	32.00	31.75	130
11	32.25	32.15	32.20	31.99	31.65	44
12	32.13	32.10	32.05	31.85	31.55	29
13	....	....	....	....	....	...
14	....	....	....	....	....	...
15	31.88	31.75	31.70	31.45	31.20	40
16	32.25	32.15	32.03	31.85	31.55	37
17	32.25	32.25	32.20	31.95	31.65	35
18	32.38	32.25	32.25	31.95	31.65	52
19	....	....	....	....	....	...
20	....	....	....	....	....	...
21	....	....	....	....	....	...
22	32.50	32.40	32.35	32.05	31.75	15
23	32.63	32.65	32.50	32.27	31.91	59
24	32.63	32.45	32.30	32.00	31.70	85
25	32.63	32.37	32.25	32.00	31.75	64
26	32.75	32.50	32.27	31.95	31.75	107
27	....	....	....	....	....	...
28	....	....	....	....	....	...
29	32.25	32.15	31.85	31.55	31.35	130
29	32.38	32.15	31.90	31.65	31.40	168

Outside Market

No. 1 Ribbed Smoked Sheets:	
Spot	.32⅝
June	.32⅜
July-Sept.	.32⅛
Thin Latex Crepe:	
Spot	.36
Thin Brown Crepe, No. 2	.28½
Flat Bark Crepe	.21⅞

London Market
(Standard Smoked Sheets)

July-Sept.	31.41 - 31.70
Oct.-Dec.	31.26 - 31.55

Singapore Market
(Standard Smoked Sheets)

June	29.73 - 29.81

Middling Upland Quotations

	April 1	May 1		
	Close	High	Low	Close
May	35.19	35.30	35.29	35.30
July	34.68	34.90	34.84	34.90
Oct.	33.57	33.67	33.64	33.66

Notes & Quotes

Demand for replacement passenger car tires by 1965 will reach a record-breaking 70,000,000 units, about 17 million more than were sold in 1956, if car registrations continue to increase at the present rate, according to Guy Gundaker, Jr., vice-president-sales of the B. F. Goodrich Tire Co. The industry in 1957 expects to ship at least 55 million passenger car tires to sales outlets, he said, a 10% increase over 1955. An analysis of the rising trend in the number of passenger cars using the nation's highways reveals why increased demand is anticipated, Mr. Gundaker said. In 1950 there were 35.7 million automobiles on the highways. This year there should be 51.5 million, a 44 per cent increase, and by 1965 there should be almost 70 million.

Synthetic Rubber

In the opinion of E. J. Thomas, president of the Goodyear Tire & Rubber Co., greatly increased production of synthetic rubber is the only means of keeping abreast of continually expanding world-wide rubber needs. Mr. Thomas believes that synthetic rubber must account for 62 per cent of an estimated rubber consumption of 1,700,000 tons by 1960.

Increased production is necessary, he stated, because natural rubber production is not increasing, and even if it were, it takes seven years until new trees can be tapped. Before World War II, U. S. consumption of new rubber amounted to some 650,000 long tons a year. After the war, consumption jumped, and in 1955, over 1.5 million long tons were consumed.

Non-Tire Synthetic Use

Mr. Thomas noted that in 1945, about 30 per cent of the synthetic rubber produced in the United States found its way into non-tire products. Today, about 37% of the synthetic produced is used in this manner.

Other factors calling for increased synthetic production include the growing foreign markets. It is expected that the use of synthetic rubber abroad will increase at a faster rate than in the United States. Per capita consumption of new rubber in the United States is set at about 20 pounds a year. In contrast, per capita consumption in Canada is 11 pounds per year, and the less developed countries of the world consume down to 0.2 of a pound per year.

In order to meet these expanding requirements, Mr. Thomas observes, we should be willing to have a surplus of general purpose synthetic rubber. The raw material supplier, he pointed out, must play a major role in increased synthetic rubber production.

Goodyear recently announced the completion of an expansion program at its Houston, Texas, synthetic rubber plant which has increased annual capacity to 220,000 long tons. A butadiene facility adjacent to the synthetic rubber plant, owned by the Petro-Tex Chemical Corp., has increased its annual capacity from 90,000 long tons a year to 200,000 long tons a year.

Inventories Still High

As of March 31, 1957, there were 132,824 long tons of GR-S type rubber in stocks on hand, according to the Rubber Manufacturers Association. As of December 31, 1956, there were 151,763 long tons in stocks, indicating that in the first three months of the current year stocks were reduced by almost 20,000 long tons.

In the first three months of the current year, about 217,000 long tons of GR-S type rubber were produced in the U. S., against the 227,000 long tons produced in the first three months of 1956. Some 204,000 long tons of GR-S type rubber were consumed in the first three months of 1957, compared with the 192,000 long tons consumed in the like period of 1956. Lowered production in the 1957 period has thus permitted the assimilation of some inventory.

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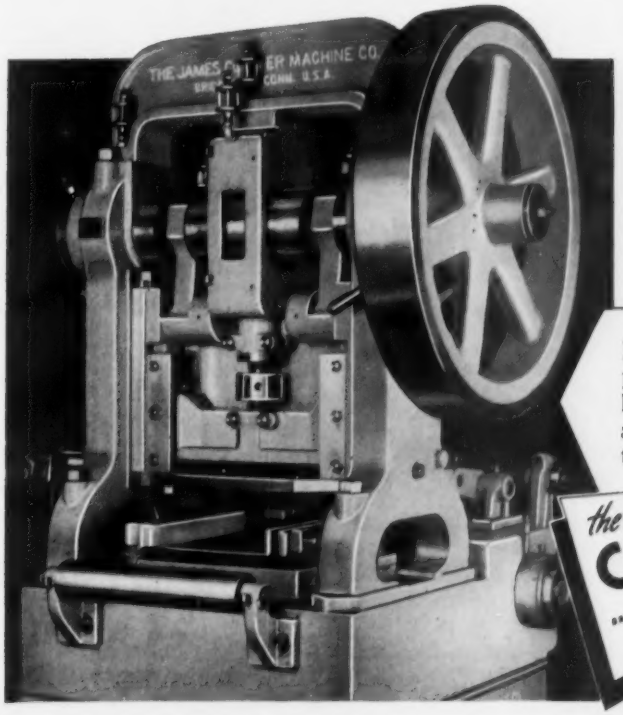

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(dry types—per pound carload unless otherwise specified)

Butadiene-Acrylonitrile Types

Butaprene NAA	.5400 [1]
Butaprene NF	.4900 [1]
Butaprene NL	.5000 [1]
Butaprene NXM	.5800 [1]
Chemigum N1	.6400 [2]
Chemigum N3	.5800 [2]
Chemigum N5	.5800 [2]
Chemigum N6	.5000 [2]
Chemigum N7	.5000 [2]
Hycar 1001	.5800 [2]
Hycar 1002	.5000 [2]
Hycar 1014	.6000 [2]
Hycar 1041	.5800 [2]
Hycar 1042	.5000 [2]
Hycar 1043	.5000 [2]
Hycar 1312	.5000 [2]
Hycar 1411	.6200 [2]
Hycar 1432	.5900 [2]
Hycar 1441	.6200 [2]
Paracril AJ	.4850 [2]
Paracril B	.5000 [2]
Paracril BJ	.5000 [2]
Paracril BLT	.5000 [2]
Paracril C	.5800 [2]
Paracril CV	.5900 [2]
Paracril D	.6500 [2]
Paracril 18-80	.6000 [2]
Polysar Krynac 800	.5000 [2]
Polysar Krynac 801	.5800 [2]
Polysar Krynac 802	.5000 [2]
Polysar Krynac 803	.5000 [2]

Butadiene-Styrene Types

Ameripol 1000	.2410 [2]
Ameripol 1001	.2410 [2]
Ameripol 1002	.2435 [2]
Ameripol 1006	.2410 [2]
Ameripol 1007	.2425 [2]
Ameripol 1009	.2475 [2]
Ameripol 1500	.2410 [2]
Ameripol 1501	.2410 [2]
Ameripol 1502	.2410 [2]
Ameripol 1703	.2060 [2]
Ameripol 1705	.2035 [2]
Ameripol 1707	.1910 [2]
Ameripol 1708	.1910 [2]
Ameripol 1710	.1885 [2]
Ameripol 1712	.1885 [2]
ASRC 1000	.2410 [2]
ASRC 1001	.2410 [2]
ASRC 1004	.2410 [2]
ASRC 1006	.2410 [2]
ASRC 1018	.2700 [2]
ASRC 1019	.2650 [2]
ASRC 1500	.2410 [2]
ASRC 1502	.2410 [2]
ASRC 1503	.2625 [2]
ASRC 1703	.2060 [2]
ASRC 1708	.1910 [2]
Baytown 1600	.1760 [2]
Baytown 1601	.1760 [2]
Baytown 1602	.1760 [2]
Baytown 1801	.1600 [2]
Copo 1500	.2410 [2]
Copo 1502	.2410 [2]
Copo 1505	.2610 [2]
Copo 1712	.1885 [2]
FR-S 1000	.2410 [2]
FR-S 1001	.2410 [2]

Butadiene-Styrene (Cont'd)

FR-S 1004	.2410 [2]
FR-S 1006	.2410 [2]
FR-S 1009	.2475 [2]
FR-S 1010	.2600 [2]
FR-S 1012	.2425 [2]
FR-S 1013	.2500 [2]
FR-S 1014	.2810 [2]
FR-S 1015	.2910 [2]
FR-S 1500	.2410 [2]
FR-S 1502	.2410 [2]
FR-S 1703	.2060 [2]
FR-S 1705	.2035 [2]
FR-S 1712	.1885 [2]
Naugapol 1016	.2650 [2]
Naugapol 1018	.2700 [2]
Naugapol 1019	.2650 [2]
Naugapol 1021	.3000 [2]
Naugapol 1022	.2800 [2]
Naugapol 1023	.2850 [2]
Naugapol 1503	.2625 [2]
Naugapol 1504	.2950 [2]
Philprene 1000	.2410 [1]
Philprene 1001	.2410 [1]
Philprene 1006	.2410 [1]
Philprene 1009	.2475 [1]
Philprene 1010	.2600 [1]
Philprene 1018	.2700 [1]
Philprene 1019	.2650 [1]
Philprene 1100	.1940 [1]
Philprene 1104	.1900 [1]
Philprene 1500	.2410 [1]
Philprene 1502	.2410 [1]
Philprene 1503	.2625 [1]
Philprene 1600	.1930 [1]
Philprene 1601	.1930 [1]
Philprene 1605	.1900 [1]
Philprene 1703	.2060 [1]
Philprene 1706	.2030 [1]
Philprene 1708	.1910 [1]
Philprene 1712	.1880 [1]
Philprene 1803	.1740 [1]
Pioflex 1006	.2410 [2]
Pioflex 1500	.2410 [2]
Pioflex 1502	.2410 [2]
Pioflex 1703	.2060 [2]
Pioflex 1710	.1885 [2]
Pioflex 1712	.1885 [2]
Pioflex 1773	.2060 [2]
Pioflex 1778	.1910 [2]
Polysar Kryflex 200	.2410 [2]
Polysar Krylene	.2410 [2]
Polysar Krylene NS	.2410 [2]
Polysar Krynol 651	.1885 [2]
Polysar Krynol 652	.1910 [2]
Polysar S	.2410 [2]
Polysar S-50	.2410 [2]
Polysar S-X 371	.2550 [2]
Polysar SS-250	.3000 [2]
S-1000	.2300 [2]
S-1001	.2300 [2]
S-1002	.2325 [2]
S-1006	.2300 [2]
S-1011	.2325 [2]
S-1013	.2300 [2]
S-1100	.1850 [2]
S-1500	.2300 [2]
S-1502	.2300 [2]
S-1600	.1825 [2]
S-1601	.1825 [2]
S-1602	.1825 [2]

Butadiene-Styrene (Cont'd)

S-1703	.1950 [2]
S-1706	.1925 [2]
S-1707	.1800 [2]
S-1709	.1775 [2]
S-1712	.1775 [2]
S-1801	.1675 [2]
Synpol 1000	.2410 [1]
Synpol 1001	.2410 [1]
Synpol 1002	.2435 [1]
Synpol 1006	.2410 [1]
Synpol 1007	.2410 [1]
Synpol 1009	.2475 [1]
Synpol 1012	.2425 [1]
Synpol 1013	.2500 [1]
Synpol 1061	.2410 [1]
Synpol 1500	.2410 [1]
Synpol 1502	.2410 [1]
Synpol 1551	.2410 [1]
Synpol 1703	.2060 [1]
Synpol 1707	.1910 [1]
Synpol 1708	.1910 [1]
Synpol 1711	.1900 [1]

Butyl Rubbers

Enjay Butyl 035	.2300 [2]
Enjay Butyl 150	.2300 [2]
Enjay Butyl 165 NS	.2400 [2]
Enjay Butyl 215	.2300 [2]
Enjay Butyl 217	.2300 [2]
Enjay Butyl 218	.2300 [2]
Enjay Butyl 268 NS	.2400 [2]
Enjay Butyl 325	.2300 [2]
Enjay Butyl 365 NS	.2400 [2]
Polysar Butyl 100	.2450 [2]
Polysar Butyl 101	.2775 [2]
Polysar Butyl 200	.2450 [2]
Polysar Butyl 300	.2450 [2]
Polysar Butyl 301	.2550 [2]
Polysar Butyl 400	.2450 [2]

Neoprene

	(prices f.o.b.)
Neoprene Types AC and CG	.5500 [2]
Neoprene Type GN	.4100 [2]
Neoprene Type GN-A	.4100 [2]
Neoprene Type GRT	.4200 [2]
Neoprene Type KNR	.7500 [2]
Neoprene Type S	.4200 [2]
Neoprene Type W	.3900 [2]
Neoprene Type WHV	.3900 [2]
Neoprene Type WRT	.4500 [2]
Neoprene Type WX	.4100 [2]

Silicone Rubbers*

	(prices f.o.b.)
GE (compounded)	2.50 [2]
GE Silicone Gum (not compounded)	4.00 [2]
Silastic (compounded)	1.90 [2]
Silastic (gums)	3.85 [2]
Union Carbide (gums)	4.00 [2]
Union Carbide (compounds)	2.50 [2]

Polysulfide Rubbers

	(prices f.o.b.)
Thiokol Type A	.4700 [2]
Thiokol Type FA	.6400 [2]
Thiokol FR-1	.9500 [2]
Thiokol Type ST	1.00 [2]

(latices—all prices per pound dry weight)

Butadiene-Acrylonitrile Types

Butaprene N-300	.4600 [1]
Butaprene N-400	.5400 [1]
Butaprene N-401	.5400 [1]
Chemigum 200	.4900 [3]
Chemigum 235	.5400 [3]
Chemigum 236	.5400 [3]
Chemigum 245	.4600 [3]
Chemigum 246	.4600 [3]
Hycar 1512	.4600 [3]
Hycar 1551	.5400 [3]
Hycar 1552	.4600 [3]
Hycar 1561	.5400 [3]
Hycar 1562	.4600 [3]
Hycar 1571	.5400 [3]
Hycar 1572	.5100 [3]
Hycar 1577	.4600 [3]
Hycar 1852	.4400 [3]

Butadiene-Styrene Types

Copo 2101	.3000 [2]
Copo 2102	.3200 [2]

Butadiene-Styrene (Cont'd)

Copo 2105	.3200 [2]
Copo X-765	.3000 [2]
FR-S 2000	.2600 [2]
FR-S 2001	.2600 [2]
FR-S 2002	.2850 [2]
FR-S 2003	.2950 [2]
FR-S 2004	.2950 [2]
FR-S 2006	.2600 [2]
FR-S 2105	.3100 [2]
Pliolite 2101	.3000 [2]
Pliolite 2104	.3200 [2]
Pliolite 2105	.3200 [2]
Pliolite X-765	.3000 [2]
Naugatex 2000	.2630 [2]
Naugatex 2001	.2630 [2]
Naugatex 2002	.2880 [2]
Naugatex 2006	.2630 [2]
Naugatex 2105	.3120 [2]
Naugatex X-765	.2900 [2]
Naugatex X-767	.3120 [2]

Butadiene-Styrene (Cont'd)

S-2000	.2275 [2]
S-2006	.2150 [2]
S-2101	.2250 [2]
S-2105	.3100 [2]

Neoprene

Neoprene Latex 60	.4000 [2]
Neoprene Latex 571	.3700 [2]
Neoprene Latex 572	.3900 [2]
Neoprene Latex 601-A	.4000 [2]
Neoprene Latex 735	.3800 [2]
Neoprene Latex 736	.3800 [2]
Neoprene Latex 842-A	.3700 [2]
Neoprene Latex 950	.4700 [2]

Polysulfide Rubbers

Thiokol Type MX	.7000 [2]
Thiokol Type WD-2	.9200 [2]
Thiokol Type WD-6	.7000 [2]

Notes: (1) Freight allowed. (2) Freight extra. (3) Freight prepaid. *Covers a wide range of compounds. Readers are urged to check specific prices with producers.

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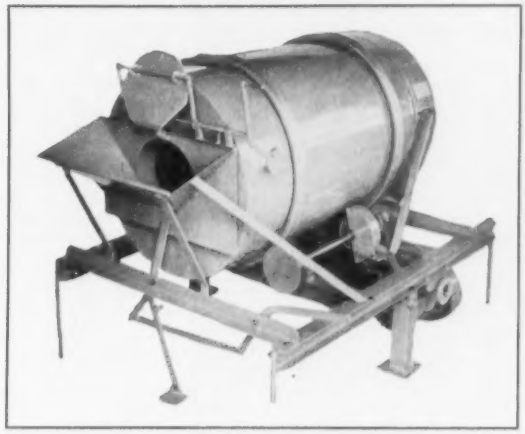

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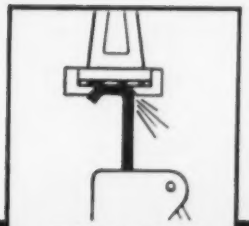
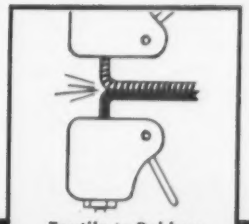
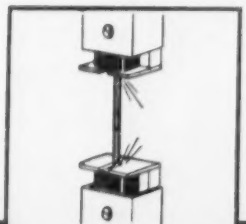


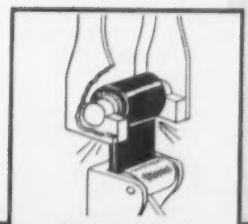
Rubber to Metal
ASTM D429-EST



Textile to Rubber or Plastic (strip)
ASTM D413-39



Cord to Rubber



Wrapped Hose (Ring Specimen)
ASTM D413-39

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REPRESENTATIVES IN FOREIGN COUNTRIES

MARKETS

(continued)

Reclaimed Rubber

Production of reclaimed rubber in March of this year totaled 25,050 long tons, according to the Rubber Manufacturers Association, Inc., bringing production in the first three months of this year to 71,936 long tons. Consumption of reclaim in the first three months of this year amounted to 71,906 long tons, and so it will be seen that production-consumption levels for reclaim are running apace. There were 25,000 long tons of reclaim consumed in March.

If the production and consumption levels were to be maintained for the balance of this year, some 287,000 long tons of reclaimed rubber will be produced and consumed in 1957. This would serve to make valid estimates made earlier in the year by many in the trade.

Exports so far this year have been running at slightly more than 1,000 tons a month and, at this rate, the total for the year should approximate the close to 14,000 long tons exported in 1956.

(Prices for All Areas Except Calif.)

	per lb.
Premium Grade Whole Tire	.11½
First Line Whole Tire	.11
Second Line Whole Tire	.10½
Third Line Whole Tire	.10¼
Fourth Line Whole Tire	.09¾
Black Carcass	.15¼
No. 1 Light Colored Carcass	.22
No. 1 Peel	.11
Butyl Tube Reclaim	.14
Natural Rubber Black Tube	.16
Natural Rubber Red Tube	.21
Natural Rubber Gray Tube	.21

Scrap Rubber

Scrap rubber exports in 1956 showed a substantial gain over 1955, according to the Bureau of the Census, U. S. Department of Commerce. It is estimated that approximately 45,000,000 pounds of scrap were exported in 1956, about 8,000,000 more than in the preceding year. Imports of scrap rubber in 1956, according to Census Bureau statistics, declined to about 23,000,000 pounds from 1955's 25,500,000 pounds.

Trade quarters are not too happy on the prospects for overseas business in 1957. It is pointed out that more scrap has become available overseas. In addition, countries that traditionally have been large purchasers of scrap rubber in the U. S. are seeking to fulfill their requirements in markets closer to home. The U. K., for example, is supplying more scrap to Spain and Japan.

(Prices Delivered Akron)

Mixed tires	ton	16.00
Light colored carcass	lb.	.05½
No. 1 peelings	ton	40.00
No. 2 peelings	ton	28.00
No. 3 peelings	ton	20.00
Buffings	ton	16.00
Truck and Bus S.A.G.	ton	19.00
Passenger S.A.G.	ton	17.50
Natural Rubber Red Tubes	lb.	.07¾
Natural Rubber Black Tubes	lb.	.07
Butyl Rubber Tubes	lb.	.04¼

Tire Fabrics

According to George L. Storm, vice-president and general manager of the Rayon Division of the American Viscose Corp., rayon tire cord has undergone some spectacular improvements recently as a result of the tire industry's drive to provide greater safety and riding comfort. He stated that the latest development in rayon tire cord, "super" rayon or "hi-test" rayon, has 50 per cent greater strength than the rayon cord used in tires a few years ago. The new rayon cord has been described by some as "pound for pound stronger than steel."

The superior tensile strength of the new rayon cord results in greater protection against tire breaks and blow-outs as well as more mileage life. As rayon is not thermoplastic, it provides more resistance to tire "growth", a tendency that has become more pronounced with the use of low pressure tires, Mr. Storm observed.

Cites Improved Flexibility

Along with its increased durability, the new rayon cord has an amazing flexibility, Mr. Storm said, that gives tires a smooth, quiet ride without annoying flat spots developing in the tires when the car is parked. More than 99 per cent of the new cars produced this year will be equipped with rayon cord tires, he declared.

Mr. Storm went on to say that the outlook for the rayon cord business during the present year is good. With the automobile business predicting new car sales to exceed 6,000,000 units for the 1957 model year, more than 30,000,000 rayon cord tires will be absorbed as original equipment.

The tire replacement business also promises to be big in 1957. Tire dealers and retreaders expect 25% more business than in 1956, according to Mr. Storm. Many of the owners of cars bought in 1955, the biggest new car sales year in history, will be in the market for replacement tires before the end of the year.

Expanding Research Program

The rayon industry's expanding research program has made it possible for rayon tire cord developments to keep pace with the exacting specifications set by the automotive industry for its original equipment tires. Continuing research and improved research facilities, promise many more notable contributions to transportation safety in this country, Mr. Storm believes.

(Prices f.o.b. Shipping Point)

Rayon Tire Cord

1100	lb.	.73
1650	lb.	.67
2200	lb.	.67½

Nylon Tire Cord

210	lb.	1.95
840	lb.	1.80

Rayon Graded Fabric

100	lb.	.69
1650	lb.	.63½
2200	lb.	.63

Cotton Chafers

8.9 oz. (per square yard)	lb.	.68
9.25 oz. (per square yard)	lb.	.66
11.65 oz. (per square yard)	lb.	.62
14.4 oz. (per square yard)	lb.	.71

Liquid Latex

Natural: In the first three months of the current year, 15,627 long tons of natural rubber latex were imported into the United States and 552 long tons re-exported, leaving a total net new supply of 15,075 long tons. A total of 20,825 long tons were consumed in the first quarter of the current year and stocks on hand as of March 31 totaled 10,041 long tons.

If natural latex imports were to continue at the same pace for the balance of 1957, about 62,000 long tons will have reached the U. S. during the year. This will be about 10,000 long tons less than imported during 1955. On the other hand, if the consumption rate shown in the first three months of the current year were to continue through the balance of the year, about 82,000 long tons will be consumed. This is about 8,000 long tons more than in the previous year.

It should be remembered that at the end of 1956, there were 12,000 long tons of natural latex in stocks on hand. As of March 31, 1957, stocks had been reduced by about 2,000 long tons. At the March 31 figure, natural latex stocks are lower than any year-end figure since 1952. Natural rubber latex is currently selling at about 38.38c per pound.

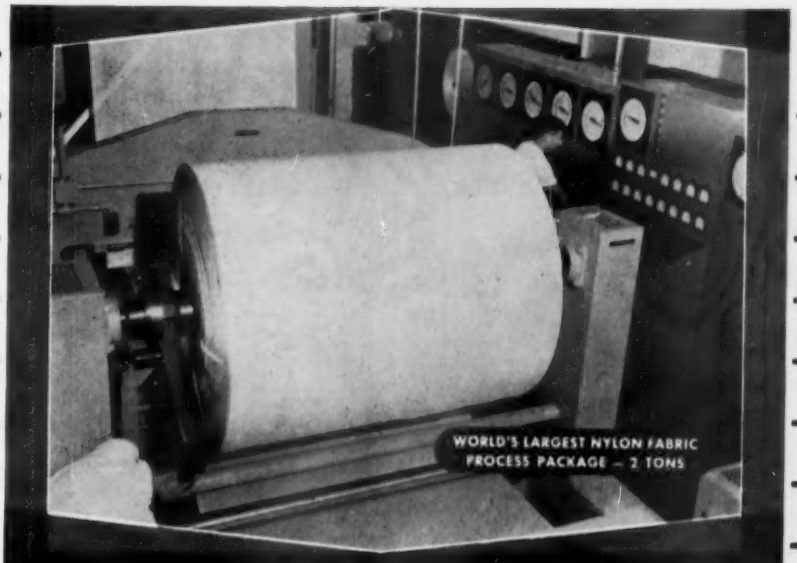
Synthetic: Production of synthetic latices in the United States is currently running at about 9,000 tons a month, with GR-S type accounting for about 7,000 long tons of this total. The remaining 2,000 long tons are divided between neoprene and nitrile types. So far in 1957, production and consumption of synthetic latices are showing a fairly stable pattern and the expectations are that this trend will hold at least for the next few months. It would seem that about 108,000 long tons of synthetic latex will be produced this year. About 84,000 long tons will be GR-S type and about 12,000 tons each for neoprene and nitrile latices.

Cotton

The price of middling uplands on the New York Cotton Exchange has moved in the extremely low range of 15 points since our last report (April 1), high for the period being 35.50c reached on April 16 and 17, and low being 35.35c reached on April 26 and on the last two trading days of the month. The average price of spot cotton for the month of April was 35.43c based on 21 trading days. This compares with an average of 35.35c in the previous month.

The American Farm Bureau Federation is expected to call for a cotton program that will embody lower price supports and increased production. Cotton producers, states AFBF, are demanding a program that will make cotton fully competitive with other fibers at the mill door and help the U. S. cotton industry recapture and extend lost or declining world markets.

Meanwhile, Department of Agriculture officials have admitted that revised cotton estimates submitted to Congress for supplemental appropriations are already outdated. The Commodity Credit Corp. said its original 1957 budget estimate called for 2,050,000 bales to enter the long program. This estimate has now been increased to 6,494,000 bales. An official confirmed that about 4 million bales were presently in the program and this figure will decrease rather than increase before the end of the fiscal season.



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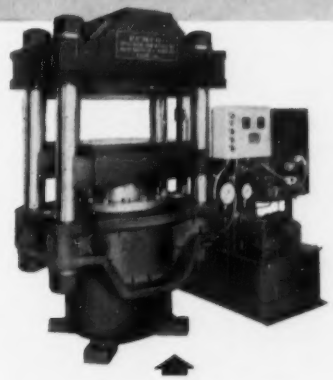

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STATISTICS of the industry

PERTINENT INDUSTRY DATA

Natural Rubber in the United States

(Including Latex and Guayule)

(All Quantities in Long Tons)

Year	New Supply	Consumption	Re-Exports	Stocks On Hand at End of Period
1931	501,788	355,200	25,609	322,000
1932	414,668	336,700	20,937	379,000
1933	418,902	412,400	20,576	365,000
1934	463,018	462,500	23,856	355,000
1935	467,146	495,500	11,391	303,000
1936	488,145	575,000	12,582	223,000
1937	600,479	543,600	7,902	262,204
1938	411,983	437,031	5,652	231,500
1939	499,473	592,000	13,125	125,800
1940	818,243	648,500	7,060	288,864
1941	1,029,007	775,000	5,376	533,344
1942	282,653	376,791	10,856	422,714
1943	55,329	317,634	20,815	139,594
1944	107,834	144,113	9,665	93,650
1945	135,672	105,429	6,743	118,715
1946	400,687	277,597	4,338	237,467
1947	688,354	562,661	4,101	129,038
1948	735,227	627,332	6,673	141,541
1949	660,792	574,522	6,253	106,619
1950	802,249	720,268	8,644	89,215
1951	733,048	454,015	2,603	76,569
1952	805,997	453,846	3,024	95,260
1953	647,150	553,473	8,376	112,316
1954	596,848	596,285	7,443	104,543
1955	635,174	634,800	10,611	110,105
1956	580,510	563,095	11,300	115,949
1956:				
Jan.	58,803	53,551	1,877	111,943
Feb.	53,353	50,285	752	111,832
Mar.	52,749	50,040	505	108,974
Apr.	51,394	47,446	731	109,822
May	39,789	48,342	753	107,324
June	36,694	42,845	865	101,748
July	41,195	38,353	712	103,301
Aug.	40,367	46,091	759	97,967
Sept.	42,974	44,179	1,184	98,069
Oct.	52,638	52,188	1,543	94,508
Nov.	49,757	42,946	707	106,316
Dec.	57,653	45,227	912	115,949
1957:				
Jan.	46,349	52,631	691	101,758

Source: U. S. Department of Commerce.

U. S. Imports of Natural Rubber

Year	Dry: Long Tons	Dry: Declared Value	Latex: Long Tons	Latex: Declared Value	Total Imports
1936	467,064	152,072,496	19,852	6,659,899	486,916
1937	574,600	237,307,041	23,185	10,213,670	597,785
1938	397,640	125,373,864	11,944	4,168,127	409,584
1939	469,946	167,586,780	27,437	10,467,552	497,383
1940	781,202	303,308,823	33,789	14,593,466	814,991
1941	989,498	401,976,317	34,797	15,965,627	1,024,245
1942	266,276	112,537,426	10,646	5,630,667	276,922
1943	50,358	31,369,198	1,890	1,312,202	52,248
1944	103,847	73,908,549	3,091	2,092,211	106,938
1945	134,408	95,814,102	4,773	3,115,853	139,181
1946	376,502	228,796,110	8,421	5,843,085	384,923
1947	691,087	306,951,814	17,542	9,787,722	708,629
1948	702,293	290,849,177	32,745	18,288,223	735,038
1949	630,808	225,343,624	29,743	14,968,650	660,551
1950	747,109	416,222,598	54,401	41,764,486	801,510
1951	677,874	727,343,348	54,963	80,178,309	732,837
1952	756,987	578,179,519	48,228	40,563,116	805,215
1953	571,635	284,909,223	75,511	46,353,333	647,146
1954	522,364	219,098,143	74,483	42,755,029	596,847
1955	542,507	360,435,303	92,825	80,163,114	635,332
1956	499,479	334,990,045	71,709	61,795,844	564,321
1956:					
Jan.	48,476	38,397,341	10,328	10,355,488	58,804
Feb.	45,682	35,983,385	7,670	7,814,076	46,449
Mar.	44,947	35,238,125	7,791	7,507,686	52,738
Apr.	44,443	31,826,631	6,996	6,369,348	51,439
May	34,058	22,579,829	5,731	4,782,907	39,789
June	31,687	19,375,943	5,006	3,732,281	36,693
July	37,673	22,164,793	3,522	2,539,365	41,195
Aug.	35,652	19,703,676	4,715	3,277,700	40,367
Sept.	40,184	23,453,972	2,790	2,207,011	42,974
Oct.	40,690	28,494,068	5,738	4,341,172	46,428
Nov.	44,995	26,695,282	4,761	3,698,504	49,756
Dec.	50,992	31,077,000	6,661	5,170,306	57,653
1957:					
Jan.	39,889	24,412,461	6,461	5,203,207	46,350

Source: Bureau of the Census, U. S. Department of Commerce.

World Production of Natural Rubber

(Including Latex)

(Long Tons)

Year	Malaya	Indonesia	Ceylon	Viet Nam & Cambodia	Latin America	Rest of World*	Total*
1945	8,600*	10,000*	97,500	12,000*	47,125	73,570	250,000
1946	403,719	175,000*	94,000	19,975	39,678*	105,080	837,500
1947	646,362	277,951	89,000	38,128	34,928*	172,782	1,260,000
1948	698,189	432,349	95,000	43,935	29,158*	225,557	1,525,000
1949	671,503	432,996	89,500	43,010	27,318*	225,659	1,490,000
1950	694,090	696,472	113,500	48,482	26,902*	280,299	1,860,000
1951	605,346	814,406	105,000	52,136	29,777*	278,262	1,885,000
1952	584,238	750,494	96,500	63,134	35,475*	261,211	1,790,000
1953	574,390	692,164	98,610	74,545	35,318*	250,182	1,725,000
1954	584,435	738,670	93,935	78,024	26,833*	280,112	1,802,500
1955	639,128	733,786	93,830	80,172	6,000*	344,584	1,897,500
1956	568,550	686,667	95,389	89,072	22,457	336,015	1,857,000
1956:							
June	52,653	47,831	6,557	7,139	1,527	29,313	145,000
July	54,685	62,715	10,503	8,146	2,830*	23,121	162,000
Aug.	53,277	84,294	9,101	8,450	1,969*	25,409	182,500
Sept.	52,033	50,223	7,600	6,989	2,286*	25,869	145,000
Oct.	52,991	56,052	7,885	9,182	500*	35,890	162,500
Nov.	49,688	66,236	9,717	10,572	500*	30,787	167,500
Dec.	58,850	72,502	11,440	11,155	500*	30,553	185,000

Source: International Rubber Study Group. * Estimated.

World Consumption of Natural and Synthetic Rubber

(Including Latex)

(Long Tons)

Year	United States	United Kingdom	Canada	Europe*	Rest of World*	Total*
1944	710,783	86,977	34,310	132,500	160,690	1,125,000
1945	799,009	91,047	41,836	87,500	108,164	1,127,500
1946	1,039,296	126,770	39,196	145,000	115,804	1,467,500
1947	1,122,327	156,399	61,452	242,500	153,548	1,735,000
1948	1,069,404	196,286	62,121	392,000	182,379	1,902,500
1949	988,903	186,622	56,362	446,500	207,388	1,887,500
1950	1,258,557	222,425	68,695	448,500	287,055	2,285,000
1951	1,214,298	238,101	70,809	476,500	314,941	2,312,500
1952	1,261,413	202,179	67,099	550,000	254,901	2,335,000
1953	1,338,309	211,453	73,394	521,000	343,606	2,500,000
1954	1,233,012	247,612	71,656	544,250	408,094	2,505,000
1955	1,529,699	266,804	84,528	630,000	464,250	2,980,000
1956	1,439,482	232,345	91,458	768,000	476,215	3,007,500
1956:						
June	111,454	19,698	7,658	77,500	36,190	252,500
July	96,549	17,565	6,831	63,000	41,055	225,000
Aug.	119,237	12,559	6,375	49,750	39,579	227,500
Sept.	113,384	17,665	7,644	60,000	46,307	245,000
Oct.	134,211	22,887	8,603	66,000	35,799	267,500
Nov.	114,472	19,504	8,598	70,250	44,676	257,500
Dec.	117,625	17,867	7,452	62,500	49,556	255,000

Source: International Rubber Study Group. * Estimated.

Rim Production

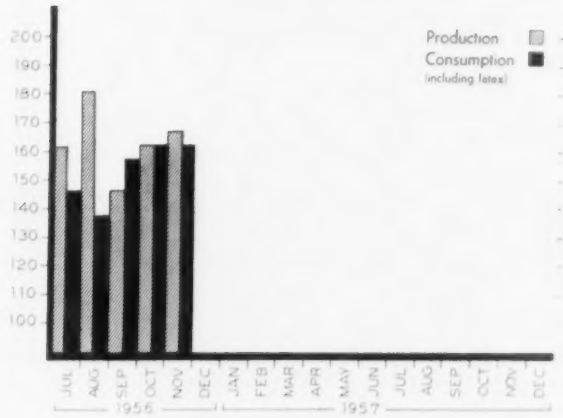
	1952	1953	1954	1955	1956
Passenger Car	24,936,844	31,318,461	25,952,322	38,092,080	27,109,610
Truck & Bus	5,752,674	5,228,321	4,463,689	6,642,329	6,315,428
Agricultural	2,073,116	1,943,487	1,297,040	1,931,768	1,416,938
Earth Mover	31,791	24,685	21,536	38,859	88,812
Total	32,794,425	38,514,954	31,734,587	46,705,036	34,930,788

	1956 Oct.	1956 Nov.	1956 Dec.	1957 Jan.	1957 Feb.	1957 Mar.
Passenger Car	2,249,790	2,744,187	2,633,768	2,797,268	2,640,338	2,644,185
Truck & Bus	563,660	386,557	408,167	468,265	449,967	475,872
Agricultural	93,601	118,435	64,640	157,773	133,593	162,928
Earth Mover	7,949	8,363	8,252	6,857	6,700	14,153
Total	2,915,000	3,257,542	3,114,827	3,430,163	3,230,598	3,297,138

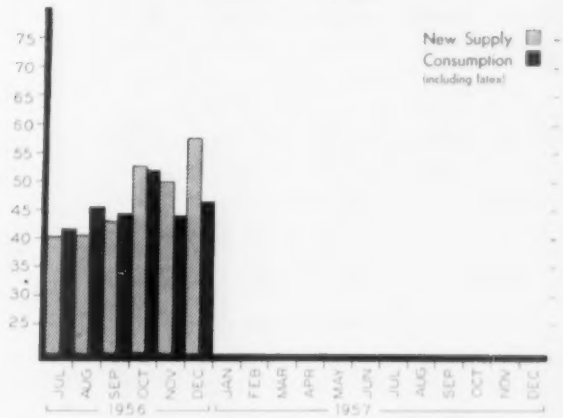
Source: The Tire & Rim Association, Inc.

STATISTICS at a glance

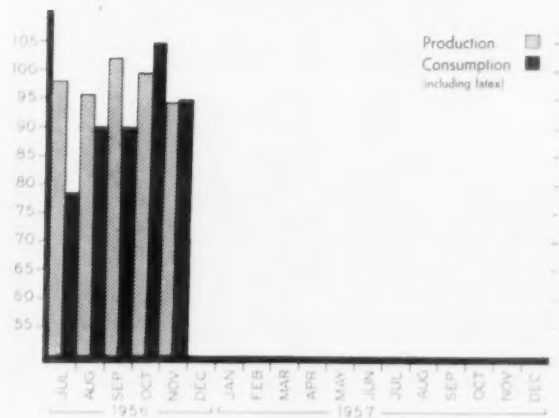
NATURAL RUBBER—WORLD
(thousands of long tons)



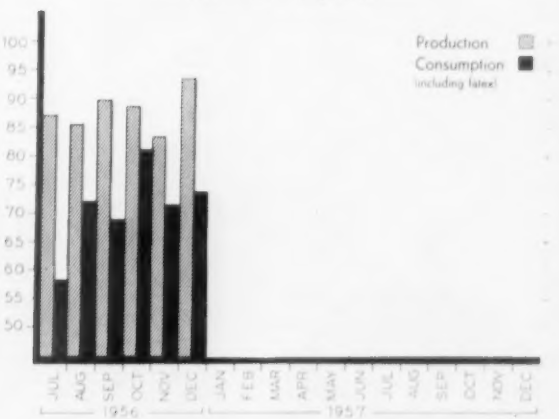
NATURAL RUBBER—UNITED STATES
(thousands of long tons)



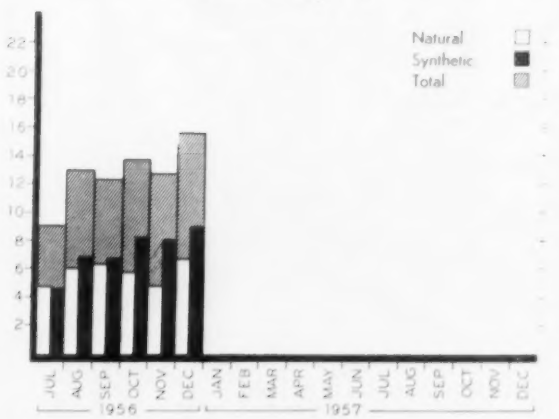
SYNTHETIC RUBBER—WORLD
(thousands of long tons)



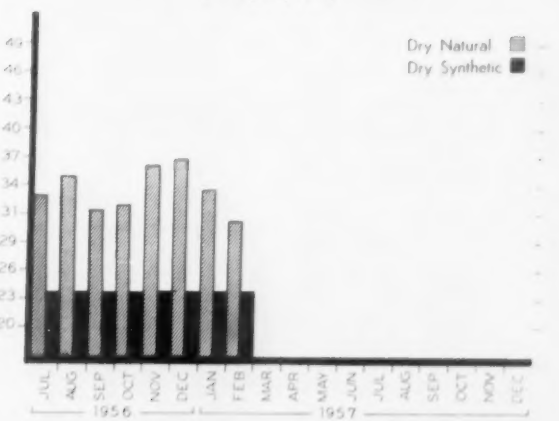
SYNTHETIC RUBBER—UNITED STATES
(thousands of long tons)



LATEX CONSUMPTION—UNITED STATES
(thousands of long tons)



PRICES—NATURAL AND SYNTHETIC
(cents per pound)



Synthetic Rubber in the United States

(All Quantities in Long Tons)

New Supply

Year	GR-S	Neoprene	Butyl	N-Type	Total
1949	**310,599**	**35,215**	**54,046**	**11,072**	**410,932**
1950	**378,887**	**50,067**	**60,915**	**12,037**	**501,906**
1951	**704,529**	**58,907**	**76,475**	**15,333**	**855,244**
1952	**654,854**	**65,745**	**81,630**	**16,228**	**818,447**
1953	**680,728**	**80,495**	**79,801**	**20,198**	**861,222**
1954	**490,405**	**69,150**	**58,802**	**21,396**	**639,753**
1955	801,145	91,357	56,179	32,623	982,304
1956	876,982	99,412	75,873	34,547	1,086,814
1956:					
Apr.	74,502	8,481	5,685	3,648	92,316
May	78,309	7,795	5,647	2,903	94,654
June	69,820	8,929	4,638	2,350	85,737
July	70,831	7,935	7,192	2,460	88,418
Aug.	70,122	7,769	7,118	2,125	87,134
Sept.	73,321	8,328	7,252	2,322	91,223
Oct.	70,690	8,144	7,018	2,973	88,825
Nov.	66,482	8,614	6,065	3,092	84,253
Dec.	76,056	8,828	6,447	2,881	94,212
1957:					
Jan.	76,224	9,432	6,366	2,957	94,979
Feb.	65,697	9,003	5,640	2,894	83,234

Consumption

1950	**416,230**	**43,781**	**66,348**	**11,930**	**538,289**
1951	**626,444**	**48,887**	**70,500**	**13,066**	**758,897**
1952	**666,420**	**55,522**	**71,229**	**13,866**	**807,037**
1953	**624,181**	**65,900**	**77,826**	**16,929**	**784,836**
1954	**500,345**	**57,203**	**61,464**	**17,715**	**636,727**
1955	741,997	72,876	53,991	26,035	894,899
1956	727,789	74,887	49,615	24,976	877,267
1956:					
Apr.	62,179	6,125	4,228	2,150	74,682
May	63,629	6,379	4,285	2,103	76,396
June	56,390	5,536	4,026	1,864	67,816
July	48,907	4,435	3,316	1,538	58,196
Aug.	59,756	6,554	4,102	2,125	72,537
Sept.	57,135	6,057	4,044	1,969	69,205
Oct.	67,399	7,478	4,780	2,366	82,023
Nov.	58,692	6,676	4,093	2,065	71,526
Dec.	61,503	5,991	3,848	1,936	73,278
1957:					
Jan.	70,978	7,237	5,028	2,247	85,490
Feb.	64,951	6,204	4,599	2,189	77,943

Exports

1949	**1,401**	**3,330**	**178**	**1,574**	**6,483**
1950	**900**	**4,826**	**31**	**1,895**	**7,652**
1951	**483**	**6,825**	**216**	**1,725**	**9,249**
1952	**9,467**	**9,813**	**126**	**2,695**	**22,101**
1953	**7,692**	**11,494**	**237**	**3,245**	**22,668**
1954	**11,069**	**12,062**	**2,831**	**4,155**	**30,117**
1955	60,704	18,098	9,895	4,593	93,290
1956	112,366	21,909	8,699	6,194	149,168
1956:					
May	10,864	2,142	743	443	14,192
June	9,310	2,088	746	548	12,692
July	9,038	1,994	523	433	11,988
Aug.	9,607	2,268	654	274	12,803
Sept.	8,804	2,824	439	403	12,470
Oct.	6,795	1,013	454	618	8,880
Nov.	4,789	1,056	247	551	6,643
Dec.	15,268	1,829	1,316	860	19,273
1957:					
Jan.	13,989	2,500	207	540	17,236

Stocks

1949	**77,731**	**4,654**	**12,224**	**3,433**	**98,042**
1950	**36,942**	**5,733**	**7,243**	**2,840**	**52,758**
1951	**105,271**	**8,379**	**12,481**	**3,821**	**129,912**
1952	**83,861**	**8,535**	**22,716**	**3,875**	**118,987**
1953	**135,153**	**11,480**	**24,866**	**4,346**	**175,845**
1954	**115,499**	**11,349**	**19,267**	**4,280**	**150,395**
1955	108,989	12,220	10,500	6,030	137,739
1956	151,763	14,077	28,744	7,934	202,518
1956:					
Apr.	121,054	12,042	14,071	8,243	155,410
May	127,163	11,478	15,253	8,788	162,682
June	133,570	12,927	15,744	2,086	164,327
July	145,601	15,084	18,899	2,009	181,593
Aug.	148,176	14,540	21,267	8,503	192,486
Sept.	154,841	14,055	23,862	8,035	200,793
Oct.	151,646	12,841	25,734	7,567	197,788
Nov.	151,143	13,459	26,998	7,734	199,334
Dec.	151,763	14,077	28,744	7,934	202,518
1957:					
Jan.	143,177	13,073	29,810	7,664	193,724
Feb.	135,234	12,628	30,062	7,577	185,501

Source: U. S. Department of Commerce.

Natural and Synthetic Rubber Latex in the United States

(All Quantities in Long Tons)

New Supply

Year	Natural	GR-S	Neoprene	N-Type	Total Synthetic	Grand Total
1945	4,768	15,176	7,077	.....	22,253	27,021
1946	8,012	24,810	13,595	.....	38,405	46,417
1947	17,675	22,474	6,089	.....	28,563	46,238
1948	32,630	21,494	5,022	.....	26,516	59.146
1949	29,974	21,357	3,651	.....	25,008	54,982
1950	54,401	31,339	5,725	.....	37,064	91,465
1951	54,963	32,972	6,866	2,948	42,786	97,749
1952	48,228	42,273	7,598	4,164	54,035	102,263
1953	75,511	48,112	9,026	5,844	62,982	138,493
1954	74,483	48,379	8,214	6,866	63,459	137,942
1955	92,754	69,364	10,432	10,798	90,594	183.348
1956	72,013	69,720	10,642	10,650	91,012	163,025
1956:						
Jan.	10,328	6,885	848	919	8,652	18,890
Feb.	7,965	6,943	930	827	8,700	16,665
Mar.	7,800	5,911	782	1,158	7,851	15,651
Apr.	6,995	6,066	969	866	7,901	14,896
May	5,731	4,966	939	614	6,519	12,250
June	5,006	4,776	907	543	6,226	11,232
July	3,522	4,241	444	731	5,416	8,938
Aug.	4,715	4,902	882	684	6,468	11,183
Sept.	2,790	5,723	1,180	938	7,841	10,631
Oct.	5,738	6,122	908	1,183	8,213	13,951
Nov.	4,762	6,053	886	1,175	8,114	12,876
Dec.	6,661	7,101	967	1,012	9,080	15,741
1957:						
Jan.	6,460	7,270	905	960	9,135	15,595
Feb.	....	6,481	724	1,035	8,240	8,240

Consumption[1]

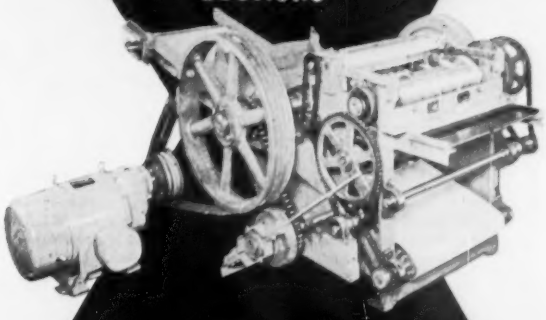
1945	**3,886**	**14,500**	**6,800**	**....**	**21,308**	**25,186**
1946	**5,714**	**23,500**	**13,000**	**....**	**36,500**	**42,214**
1947	**13,909**	**22,500**	**6,500**	**....**	**29,000**	**42,909**
1948	**28,489**	**21,500**	**5,250**	**....**	**26,750**	**55,239**
1949	**36,117**	**21,500**	**3,750**	**....**	**25,250**	**61,367**
1950	**56,138**	**31,000**	**5,500**	**....**	**36,500**	**92,638**
1951	**46,750**	**31,031**	**6,279**	**2,628**	**39,938**	**86,688**
1952	**53,567**	**40,562**	**7,368**	**3,093**	**51,023**	**104,590**
1953	**67,375**	**46,473**	**7,981**	**3,654**	**58,108**	**125,483**
1954	**75,931**	**44,173**	**7,251**	**4,507**	**55,931**	**131,862**
1955	86,478	63,982	8,736	8,495	81,213	167,691
1956	74,082	62,762	8,708	8,021	79,491	153,573
1956:						
Jan.	6,776	5,858	772	670	7,300	14,076
Feb.	6,399	5,913	787	730	7,430	13,829
Mar.	6,438	5,888	729	781	7,398	13,836
Apr.	5,693	4,923	741	692	6,356	12,049
May	5,239	4,745	778	691	6,214	11,453
June	5,171	4,350	637	657	5,644	10,815
July	4,855	3,731	562	466	4,759	9,614
Aug.	6,374	5,055	816	698	6,569	12,943
Sept.	6,233	4,937	692	699	6,328	12,561
Oct.	7,825	6,175	795	681	7,651	15,476
Nov.	6,431	5,406	723	659	6,788	13,219
Dec.	6,648	5,781	676	597	7,054	13,702
1957:						
Jan.	6,994	6,288	856	841	7,985	14,979
Feb.	6,756	6,109	724	588	7,421	14,177

Stocks at End of Period

1945	3,121	....	....	....	....	3,121
1946	4,865	....	....	....	....	4,865
1947	5,033	....	....	....	....	5,033
1948	11,235	....	....	....	....	11,235
1949	5,063	....	....	....	....	5,063
1950	4,927	....	....	....	....	4,927
1951	4,752	3,727	1,245	532	5,504	10,256
1952	6,201	5,040	1,019	902	6,961	13,162
1953	13,532	4,794	1,117	721	6,632	20,164
1954	11,133	5,134	1,087	811	7,032	18,165
1955	13,203	6,980	1,236	1,807	10,203	23,406
1956	12,064	7,451	1,384	1,558	10,393	22,457
1956:						
Jan.	16,059	6,522	1,093	1,906	9,521	25,580
Feb.	16,735	7,011	1,162	1,943	10,116	26,851
Mar.	18,309	6,867	1,097	2,340	10,304	28,613
Apr.	21,384	7,415	1,163	2,272	10,850	32,234
May	21,234	7,516	1,218	2,194	10,928	32,162
June	21,033	7,447	1,328	2,086	10,861	31,894
July	19,952	7,288	1,109	2,009	10,406	30,358
Aug.	18,099	6,402	1,076	1,703	9,181	27,280
Sept.	15,403	6,625	1,328	1,523	9,476	24,879
Oct.	12,322	5,703	1,263	1,680	8,646	20,968
Nov.	11,148	6,282	1,233	1,939	9,454	20,602
Dec.	12,064	7,451	1,384	1,558	10,393	22,457
1957:						
Jan.	11,831	7,191	1,329	1,936	10,456	22,287
Feb.	9,924	7,744	1,052	1,583	10,379	20,303

Source: U. S. Department of Commerce.
Note: (1) GR-S and Neoprene consumption estimated through 1950.

CUT YOUR RUBBER SHEETS into Exact Sections



with a **TAYLOR-STILES RUBBER CUTTER!**

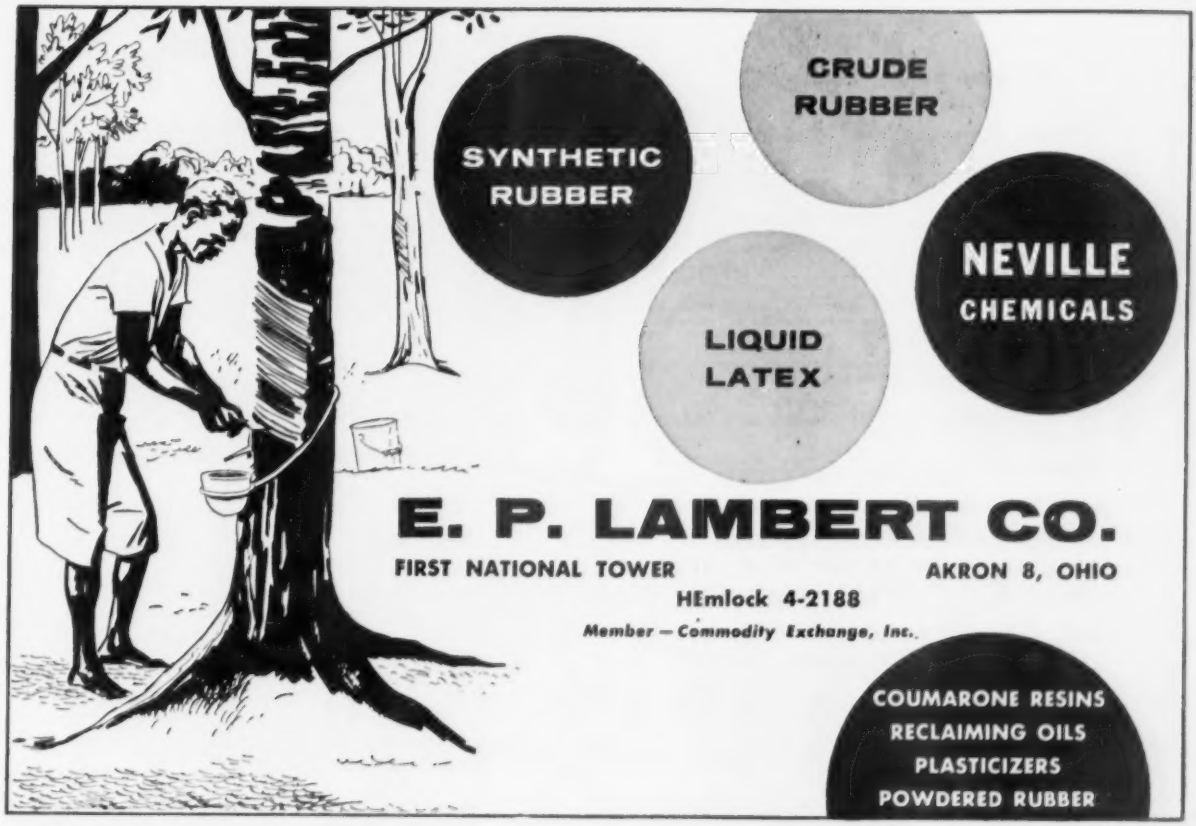
By using this Taylor-Stiles Rubber Cutter your sections will be exactly uniform in shape and size. In actual plant operations manufacturers have found that their sections were uniform to within 1/8 ounce.

Production is high. In one instance a Taylor-Stiles Rubber Cutter cut 6 foot x 2 foot sheets into 5" wide strips and then cross cut these strips into 5" squares at the rate of 4648 squares per minute.

Taylor-Stiles Cutters are also used for pelletizing and cutting for latex.

Write for folder today.

TAYLOR, STILES & COMPANY
216 Bridge Street, Riegelsville, N. J.



Rubber Industry Employment Earnings and Hours

All Rubber Products

Mo.	1955 Production Workers (thousands)	1955 Average Weekly Earnings	1955 Average Weekly Hours	1955 Average Hourly Earnings	1956 Production Workers (thousands)	1956 Average Weekly Earnings	1956 Average Weekly Hours	1956 Average Hourly Earnings
Jan.	208.5	$83.84	41.3	$2.03	229.5	$87.91	40.7	$2.16
Feb.	209.4	84.25	41.3	2.04	224.5	85.81	40.1	2.14
Mar.	211.6	83.64	41.0	2.04	220.8	84.93	39.5	2.15
Apr.	210.9	86.53	41.8	2.07	218.7	85.79	39.9	2.15
May	215.7	87.36	42.0	2.08	216.0	86.18	39.9	2.16
June	219.0	88.83	42.3	2.10	208.5	84.93	39.5	2.15
July	215.7	86.32	41.3	2.09	208.0	86.15	39.7	2.17
Aug.	216.8	86.32	41.3	2.09	210.8	87.64	40.2	2.18
Sept.	223.1	86.74	41.5	2.09	215.4	89.51	40.5	2.21
Oct.	226.4	89.04	42.0	2.12	220.0	90.17	40.8	2.21
Nov.	231.2	92.01	42.4	2.17	198.9	88.29	40.5	2.18
Dec.	233.9	89.21	41.3	2.16	221.5	93.15	41.1	2.25
Tires and Tubes								
Jan.	85.3	97.41	41.1	2.37	93.7	101.00	40.4	2.50
Feb.	86.5	96.46	40.7	2.37	93.2	97.71	39.4	2.48
Mar.	87.4	95.51	40.3	2.37	92.6	97.25	38.9	2.50
Apr.	88.6	102.18	42.4	2.41	91.8	98.00	39.2	2.50
May	89.8	101.88	42.1	2.42	91.6	99.65	39.7	2.51
June	91.0	105.60	43.1	2.45	90.1	98.25	39.3	2.50
July	91.5	103.33	42.7	2.42	90.0	98.14	39.1	2.51
Aug.	91.0	102.72	42.1	2.44	89.8	101.20	40.0	2.53
Sept.	91.9	101.02	41.4	2.44	91.6	102.51	40.2	2.55
Oct.	92.3	103.74	42.0	2.47	91.7	102.66	40.1	2.56
Nov.	94.2	106.26	42.0	2.53	74.8	103.53	40.6	2.55
Dec.	94.7	99.30	39.8	2.50	93.2	109.25	41.7	2.62
Rubber Footwear								
Jan.	22.1	68.97	40.1	1.72	21.0	74.37	40.2	1.85
Feb.	21.5	69.72	40.3	1.73	20.9	74.74	40.4	1.85
Mar.	21.5	69.72	40.3	1.73	20.7	71.34	39.2	1.82
Apr.	21.3	70.82	40.7	1.74	20.3	72.25	39.7	1.82
May	21.3	70.07	40.5	1.73	20.0	72.25	39.7	1.82
June	21.6	71.34	41.0	1.74	19.4	70.53	39.4	1.79
July	21.8	70.99	40.8	1.74	18.9	71.28	39.6	1.80
Aug.	21.5	67.25	39.1	1.72	19.2	70.35	39.3	1.79
Sept.	23.5	67.60	39.3	1.72	19.3	71.71	39.4	1.82
Oct.	24.4	69.20	40.0	1.73	91.1	71.71	39.4	1.82
Nov.	25.5	77.89	42.1	1.85	18.7	71.53	39.1	1.83
Dec.	26.2	74.89	40.7	1.84	18.4	73.26	39.6	1.85
All Other Rubber Products								
Jan.	101.1	76.08	41.8	1.82	114.8	79.73	41.1	1.94
Feb.	101.4	76.86	42.0	1.83	110.4	77.95	40.6	1.92
Mar.	102.7	76.49	41.8	1.83	107.5	76.99	40.1	1.92
Apr.	101.0	76.54	41.6	1.84	106.6	77.95	40.6	1.92
May	104.6	78.68	42.3	1.86	104.4	76.99	40.1	1.92
June	106.4	77.93	41.9	1.86	99.0	76.02	39.8	1.91
July	102.4	74.37	40.2	1.85	99.1	77.78	40.3	1.93
Aug.	104.3	75.85	41.0	1.85	101.8	78.76	40.6	1.94
Sept.	107.7	78.96	42.0	1.88	104.5	81.18	41.0	1.98
Oct.	109.7	80.56	42.4	1.90	109.2	82.98	41.7	1.99
Nov.	111.5	83.03	42.8	1.94	105.4	79.98	40.6	1.97
Dec.	113.0	83.69	42.7	1.96	109.9	82.59	41.5	1.99

Source: U. S. Department of Labor.
Note: Data are based upon reports from cooperating establishments covering both full and part-time employees who work during, or received pay for, any part of the pay period ending nearest the 15th of the month. These employment series have been adjusted to first quarter 1954 benchmark levels indicated by data from government social insurance programs. Hours and earnings data pertain only to production and related workers.

Spot Closing Cotton Prices

(Middling Upland Grade—New York Market—in Cents)

Average Monthly Price Per Pound

	1950	1951	1952	1953	1954	1955	1956	1957
Jan.	31.89	45.04	42.96	33.24	34.15	35.07	35.24	34.82
Feb.	32.79	(a)	41.64	33.76	35.00	35.04	36.26	34.82
Mar.	32.65	46.06	41.70	34.10	35.23	34.33	36.70	35.35
Apr.	33.23	46.06	41.79	33.85	35.22	34.23	36.81	35.43
May	33.64	46.06	39.98	34.30	35.34	34.80	36.65	....
June	34.61	46.06	41.31	34.11	35.17	34.83	36.67	....
July	38.11	46.21	40.37	34.20	35.37	34.61	35.43	....
Aug.	38.93	35.93	40.42	33.82	35.19	34.53	34.31	....
Sept.	41.62	36.20	39.75	33.69	35.46	33.85	34.35	....
Oct.	40.66	38.13	37.52	33.53	35.24	33.93	34.45	....
Nov.	43.11	42.70	35.59	33.60	34.80	34.87	34.56	....
Dec.	43.37	43.32	33.76	33.52	35.03	34.95	34.56	....
Average for Year	37.05	42.43	39.71	33.81	35.10	34.59	35.50	....

Note: The Government established a ceiling of 45.76c for spot cotton on March 3, 1951. (a) Trading suspended during February.

Production Index for the Rubber Industry

(1947-1949 = 100)

(Based on man-hours)

	1954	1955	1956		1954	1955	1956
Jan.	114	145	147	July	85	137	119
Feb.	114	144	140	Aug.	94	138	132
Mar.	118	146	135	Sept.	118	142	133
Apr.	116	147	137	Oct.	132	147	136
May	121	146	131	Nov.	124	147	126
June	121	149	122	Dec.	128	144	139

Sales by the Rubber Industry

(in Millions of Dollars*)

	1954	1955	1956		1954	1955	1956
Jan.	361	424	415	July	393	471	459
Feb.	360	440	445	Aug.	352	456	436
Mar.	378	466	451	Sept.	346	456	429
Apr.	382	445	445	Oct.	346	447	454
May	378	465	464	Nov.	404	482	463
June	385	465	450	Dec.	417	465	461

Rubber Manufacturers' Inventories

(in Millions of Dollars*)

	1954	1955	1956		1954	1955	1956
Jan.	835	790	935	July	787	853	987
Feb.	848	782	970	Aug.	754	863	1,007
Mar.	844	805	979	Sept.	799	874	1,007
Apr.	813	784	970	Oct.	835	902	1,022
May	798	810	985	Nov.	811	935	1,024
June	817	850	975	Dec.	821	934	998

Source: U. S. Department of Commerce.
Notes: * Adjusted for seasonal variation.

No. 1 R.S.S.—Annual Average Prices

(New York Market—Cents per Pound)

Year	High	Low	Avg.	Year	High	Low	Avg.
1915	79	58½	65.85	1936	23	13½	16.41
1916	102	55	72.50	1937	26¾	14	19.39
1917	90	52	72.23	1938	17⅞	10¼	14.64
1918	70	40	60.15	1939	24	14⅛	17.57
1919	57	38½	48.70	1940	24	18¼	20.10
1920	56½	16	36.30	1941	24⅞	19¼	22.40
1921	21¼	11½	16.36	1942	22½	22½	22.50
1922	28¾	13¾	17.50	1943	22½	22½	22.50
1923	37⅛	24¾	29.45	1944	22½	22½	22.50
1924	40⅛	17⅜	26.20	1945	22½	22½	22.50
1925	121	34⅜	72.46	1946	22½	22½	22.50
1926	88½	36¼	48.50	1947	25	14	20.00
1927	41⅜	33	37.72	1948	25	18	21.99
1928	41¼	17	22.48	1949	19¾	15⅞	17.57
1929	26⅛	15½	20.55	1950	86	18	41.10
1930	16½	7½	11.98	1951	76	52	(a)
1931	8⅜	4¼	6.17	1952*	33	26½	29.15
1932	4¾	2½	3.49	1953	31⅞	19⅜	24.21
1933	9⅜	2⅞	5.96	1954	34½	19½	23.61
1934	15⅞	8¾	12.92	1955	52	29⅜	39.16
1935	13¾	10½	12.37	1956	45	26½	34.24

Note: Price was fixed by Government on August 6, 1941, at 22½c a pound for non-war uses. Free trading was resumed May 1, 1947. (a) Free trading suspended March 31, 1951. GSA selling price ranged between 52 and 66c during balance of year. * Free trading was resumed on July 1, 1952; figures represent only July through December, 1952.

No. 1 R.S.S.—Monthly Average Prices

(New York Market—Cents per pound)

	1950	1951	1952	1953	1954	1955	1956	1957
Jan.	18.33	71.21	....	29.40	20.22	33.92	41.70	33.32
Feb.	19.40	73.61	....	27.57	19.98	34.90	33.68	30.43
Mar.	19.86	72.05	....	26.59	20.16	31.08	33.68	31.76
Apr.	23.51	....	....	24.66	22.06	31.75	31.74	32.23
May	28.07	....	....	25.52	21.96	31.35	29.61	....
June	30.92	....	....	24.42	23.01	34.74	30.54	....
July	39.10	....	30.52	23.64	24.12	40.84	33.91	....
Aug.	51.63	....	29.36	23.36	23.26	45.85	35.69	....
Sept.	55.98	....	27.42	23.06	23.99	48.27	32.64	....
Oct.	62.19	....	27.26	20.82	26.57	43.81	32.68	....
Nov.	73.05	....	29.25	20.58	28.07	44.95	35.18	....
Dec.	71.20	....	31.26	20.92	29.88	48.40	37.01	....
Average for Year	41.10	(*)	29.15	24.21	23.61	39.16	34.24	....

Note: (*) Free trading suspended March 31, 1951, and resumed on July 1, 1952.

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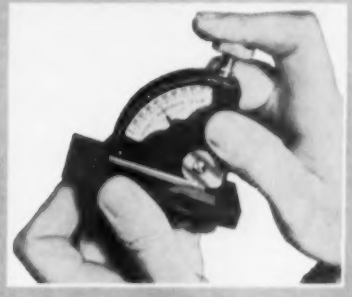

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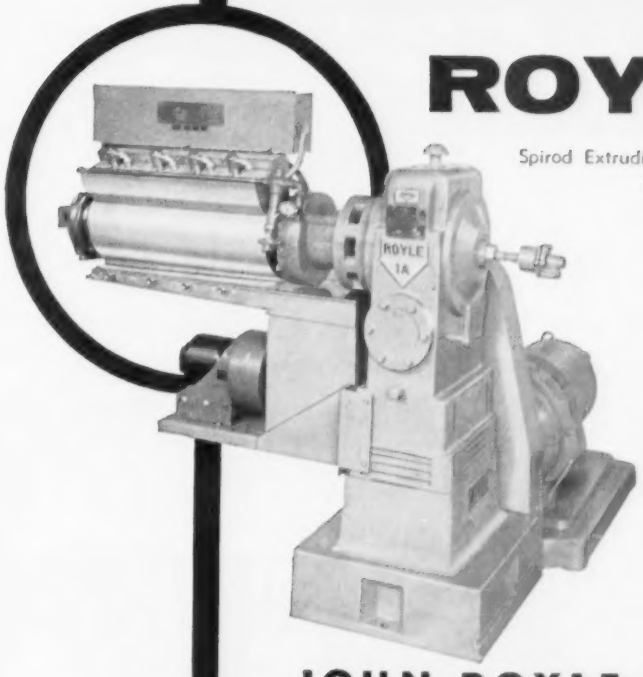

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PATERSON 3, NEW JERSEY

Automotive Pneumatic Casings

(Thousands of Units)

	Shipments					
	Original Equipment	Replacement	Export	Total	Production	Inventory End of Period
1951 (total)	32,153	44,612	1,677	78,442	83,405	8,765
Passenger Car	26,729	34,226	723	61,678	65,546	6,973
Truck and Bus	5,424	10,386	954	16,764	17,859	1,791
1952 (total)	29,484	54,342	1,520	85,346	90,411	14,110
Passenger Car	24,106	45,458	741	70,305	74,341	11,251
Truck and Bus	5,378	8,884	779	15,041	16,070	2,859
1953 (total)	37,949	55,124	1,543	94,617	96,150	15,720
Passenger Car	33,106	45,798	809	79,713	81,455	13,044
Truck and Bus	4,843	9,326	734	14,904	14,696	2,676
1954 (total)	33,333	55,155	1,753	90,241	89,141	14,762
Passenger Car	29,741	47,044	928	77,713	76,794	12,217
Truck and Bus	3,591	8,111	826	12,528	12,347	2,545
1955 (total)	47,374	59,246	1,879	108,499	112,178	18,778
Passenger Car	42,574	50,189	966	93,730	97,223	15,963
Truck and Bus	4,800	9,057	912	14,769	14,955	2,815
1956 (total)	35,422	62,146	1,757	99,325	100,406	79,872
Passenger Car	30,873	53,252	875	85,000	85,546	16,494
Truck and Bus	4,548	8,894	883	14,325	14,859	3,378
1956:						
Jan. (total)	3,402	4,669	131	8,203	8,979	19,517
Passenger Car	2,958	4,040	66	7,064	7,661	16,546
Truck and Bus	444	629	65	1,139	1,318	2,971
Feb. (total)	3,342	3,952	178	7,473	8,897	20,933
Passenger Car	2,919	3,387	90	6,396	7,571	17,701
Truck and Bus	424	565	88	1,077	1,326	3,232
Mar. (total)	3,466	5,034	127	8,627	9,193	21,562
Passenger Car	3,027	4,372	65	7,464	7,812	18,096
Truck and Bus	439	662	62	1,163	1,382	3,465
Apr. (total)	3,217	5,761	141	9,119	8,834	21,132
Passenger Car	2,787	4,994	67	7,847	7,530	17,649
Truck and Bus	430	767	74	1,271	1,303	3,483
May (total)	2,770	5,980	130	8,880	8,986	21,296
Passenger Car	2,349	5,203	65	7,617	7,628	17,714
Truck and Bus	421	777	65	1,264	1,358	3,582
June (total)	2,533	6,627	129	9,289	7,929	19,947
Passenger Car	2,162	5,659	64	7,885	6,600	16,443
Truck and Bus	372	968	65	1,404	1,329	3,503
July (total)	2,833	6,319	145	9,298	6,741	17,394
Passenger Car	2,471	5,482	73	8,026	5,668	14,088
Truck and Bus	362	837	72	1,271	1,073	3,306
Aug. (total)	2,302	6,178	163	8,644	8,050	16,794
Passenger Car	1,953	5,359	77	7,389	6,897	13,578
Truck and Bus	349	819	86	1,254	1,153	3,217
Sept. (total)	1,553	5,238	162	6,952	7,800	17,648
Passenger Car	1,261	4,427	70	5,758	6,647	14,468
Truck and Bus	291	811	92	1,194	1,153	3,180
Oct. (total)	2,908	4,703	165	7,776	8,799	18,775
Passenger Car	2,530	3,854	87	6,471	7,526	15,607
Truck and Bus	378	849	78	1,305	1,273	3,168
Nov. (total)	3,516	3,881	121	7,518	7,641	18,803
Passenger Car	3,179	3,255	62	6,496	6,580	15,596
Truck and Bus	337	626	59	1,022	1,060	3,207
Dec. (total)	3,579	3,803	166	7,548	8,556	19,872
Passenger Car	3,277	3,220	90	6,587	7,425	16,494
Truck and Bus	301	583	76	961	1,130	3,378
1957:						
Jan. (total)	3,496	5,195	183	8,874	9,504	20,490
Passenger Car	3,192	4,519	99	7,810	8,296	16,978
Truck and Bus	305	677	83	1,065	1,208	3,512
Feb. (total)	3,363	5,049	127	8,539	9,169	21,008
Passenger Car	3,017	4,453	68	7,538	8,047	17,376
Truck and Bus	346	595	59	1,001	1,122	3,632

Source: The Rubber Manufacturers Association, Inc.

Automobile Production in U. S.

(Civilian Production Only)

Year	Passenger Cars	Trucks	Total	Year	Passenger Cars	Trucks	Total
1937	**3,915,889**	**892,382**	**4,808,271**	**1947**	**3,558,178**	**1,220,634**	**4,778,812**
1938	**2,000,985**	**485,852**	**2,486,837**	**1948**	**3,909,270**	**1,363,856**	**5,273,126**
1939	**2,866,796**	**704,308**	**3,571,104**	**1949**	**5,108,841**	**1,123,736**	**6,232,577**
1940	**3,692,328**	**721,637**	**4,413,965**	**1950**	**6,665,836**	**1,332,263**	**7,998,099**
1941	**3,744,500**	**875,381**	**4,619,681**	**1951**	**5,337,729**	**1,420,432**	**6,758,161**
1942	**220,814**	**133,083**	**353,897**	**1952**	**4,320,794**	**1,212,790**	**5,533,584**
1943	**0**	**4,501**	**4,501**	**1953**	**6,121,787**	**1,202,196**	**7,323,983**
1944	**0**	**124,819**	**124,819**	**1954**	**5,558,897**	**1,038,045**	**6,596,942**
1945	**83,792**	**313,643**	**397,435**	**1955**	**7,920,186**	**1,245,018**	**9,165,204**
1946	**2,148,699**	**930,760**	**3,079,429**	**1956**	**5,816,109**	**1,100,417**	**6,916,526**
1955:							
Jan.	635,513	89,676	725,189	July	658,736	109,589	768,325
Feb.	677,705	67,061	744,766	Aug.	620,610	95,119	715,729
Mar.	791,280	102,992	894,272	Sept.	467,845	91,894	559,739
Apr.	753,434	127,887	881,321	Oct.	505,177	95,610	600,787
May	721,139	127,941	849,080	Nov.	745,993	114,448	860,441
June	647,658	119,215	766,873	Dec.	695,096	103,586	799,092
1956:							
Jan.	591,032	98,968	690,000	July	440,980	80,731	521,711
Feb.	560,924	102,384	663,308	Aug.	417,020	85,827	502,847
Mar.	583,169	106,379	689,548	Sept.	203,888	71,299	275,187
Apr.	552,881	101,081	653,962	Oct.	352,140	92,684	444,824
May	474,010	96,114	570,124	Nov.	576,708	90,246	666,954
June	445,758	91,791	537,549	Dec.	617,599	82,913	700,512

Source: Automobile Manufacturers Association.
Note: Figures are based on factory sales. Revisions are made from time to time in these figures and the latest issue should be consulted for accuracy.

Automotive Inner Tubes

(Thousands of Units)

Year	Shipments: Original Equipment	Shipments: Replacement	Shipments: Export	Shipments: Total	Production	Inventory End of Period
1946	15,327	59,357	1,424	76,108	77,251	3,820
1947	25,046	46,560	2,483	74,088	79,181	8,059
1948	26,833	40,548	1,119	68,499	70,033	9,641
1949	31,521	31,450	887	63,858	65,114	10,657
1950	41,240	42,671	811	84,723	80,179	...
1951	32,151	32,284	1,071	65,507	67,249	10,094
1952	29,451	32,985	1,014	63,449	65,073	12,036
1953	37,957	36,072	878	74,907	74,425	11,874
1954	25,071	35,576	945	61,593	48,279	9,519
1955	5,001	33,387	1,001	39,389	35,900	6,833
1956	3,100	32,358	1,040	36,498	34,405	6,109
1956:						
June	269	3,023	79	3,370	2,837	7,349
July	247	3,055	82	3,384	2,300	6,418
Aug.	242	2,954	99	3,295	2,795	5,962
Sept.	213	2,472	91	2,777	2,773	6,056
Oct.	261	2,518	98	2,877	3,025	6,469
Nov.	259	2,468	65	2,792	2,585	6,250
Dec.	235	2,515	87	2,837	2,670	6,109
1957:						
Jan.	234	3,494	101	3,829	3,364	5,789
Feb.	267	2,964	61	3,291	3,362	5,960

Source: The Rubber Manufacturers Association, Inc.

Vinyl and Vinyl Copolymer Resins—Sales

(Thousands of Pounds—Resin Content)

	Polyvinyl Chloride and Copolymer Resins: Film	Sheeting	Molding & Extrusion	Textile & Paper Treating	Flooring	Protective Coatings	All Other Uses	All Other Vinyl Resins: Adhesives	All Other Uses	Grand Total
1953	**63,691**	**62,385**	**129,215**	**52,353**	**22,152**	**22,823**	**27,790**	**22,411**	**77,478**	**480,299**
1954	**69,943**	**56,588**	**147,284**	**49,546**	**34,890**	**23,676**	**35,148**	**26,609**	**74,090**	**517,773**
1955	**83,276**	**51,424**	**183,736**	**64,223**	**56,357**	**27,439**	**53,868**	**31,853**	**105,644**	**657,821**
1956	**78,063**	**55,598**	**206,726**	**62,931**	**65,384**	**28,522**	**71,859**	**36,565**	**115,151**	**720,799**
1956:										
Jan.	6,496	4,928	16,842	6,176	5,181	2,289	6,584	3,331	10,628	62,455
Feb.	6,849	5,296	16,509	5,187	4,894	1,792	6,185	2,718	8,696	58,126
Mar.	7,388	5,280	16,965	4,962	5,016	2,274	5,811	3,162	9,364	60,222
Apr.	6,247	4,674	15,560	4,646	4,494	2,344	7,295	3,114	11,612	59,986
May	5,948	4,403	16,470	4,322	5,075	2,458	6,087	3,288	10,158	58,209
June	5,345	4,217	14,946	4,727	5,316	2,364	5,228	2,863	7,731	52,737
July	4,722	3,714	15,203	4,298	4,231	2,681	2,321	3,165	8,146	48,481
Aug.	6,497	4,787	17,490	5,727	6,798	2,416	7,228	3,256	9,213	63,412
Sept.	7,159	4,194	17,228	5,198	5,526	2,025	5,945	2,893	9,291	59,458
Oct.	8,581	5,341	21,339	6,384	6,790	2,568	5,984	3,231	10,773	70,992
Nov.	7,002	4,774	19,895	5,888	6,253	2,639	6,128	3,115	10,242	65,936
Dec.	5,829	3,990	18,279	5,416	5,810	2,672	7,063	2,429	9,297	60,785
1957:										
Jan.	8,094	5,761	18,505	6,197	5,958	3,077	3,438	2,988	10,408	64,426
Feb.	8,669	4,564	19,805	5,137	6,221	2,682	3,258	3,255	9,529	63,120

Source: Chemical Division, U. S. Tariff Commission.

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557

Various Compounding Materials Consumed by the Rubber Industry

Material	1949	1950	1951	1952	1953	1954	1955
Antimony, Primary:							
Short tons	55	103[c]	19[c]	66[c]	20[c]	49[c]	45[c]
% of total	.005	.007	.001	.004	.001	.004	.004
Asphalt: [a]							
Short tons	18,050	26,819	21,414	33,288	.....	.....	.....
% of total	0.3	0.3	0.3	0.4	.....	.....	.....
Barite (Barytes):							
Short tons	14,000	19,000	15,000	18,000	21,000	20,000	.....
% of total	2.53	3.31	2.13	2.0	2.0	2.0	.....
Carbon Black:							
Short tons	383,565	515,184	530,614	537,273	566,797	511,813	.....
% of total	93.3	92.9	93.9	93.1	94.4	.....	.....
Clay, Kaolin:							
Short tons	197,341	263,306	231,331	240,982	241,052	247,431	.....
% of total	13.1	15.0	12.7	13.2	12.8	13.2	.....
Clay, Fire & Stoneware:							
Short tons	27,148	9,500	.....	9,322	18,475	8,781	.....
% of total	0.3	0.1	.....	0.1	.2	.1	.....
Lime:							
Short tons	215	908	1,126	2,000	1,631	1,555	.....
% of total	.0062	.0002	[d]	[d]	[d]	[d]	.....
Litharge:							
Short tons	1,398	3,047	2,641	2,109	2,230	1,768	.....
% of total	1.2	1.7	1.7	1.5	1.4	1.3	.....
Lithopone:							
Short tons	3,245	4,092	3,295	1,523	1,723	1,701	.....
% of total	4.1	3.9	3.2	2.5	3.3	3.9	.....
Mica, Ground:							
Short tons	3,856	5,776	6,551	5,126	5,668	5,021	.....
% of total	7.0	8.0	9.0	7.0	7.8	6.3	.....
Sulfur:							
Short tons	59,360	75,000	75,000	75,000	80,000	.....	.....
% of total	1.3	1.3	1.4	1.4	1.4	.....	.....
Talc: [b]							
Short tons	53,400	75,900	70,970	64,476	32,137	30,621	.....
% of total	12.0	12.0	11.2	10.9	0.7	.07	.....
Zinc Oxide:							
Short tons	58,496	82,944	71,507	72,774	78,439	71,058	.....
% of total	52.5	51.6	48.4	51.2	52.7	50.7	.....

Source: U. S. Bureau of Mines.
Notes: (a) Solid and semi-solid products of less than 200 penetration. (b) Includes prophyllite and ground soapstone. (c) Does not include precipitated antimony sulfide as in previous years. (d) Negligible.

Reclaimed Rubber

(Including Natural and Synthetic)

(All Quantities in Long Tons)

Year	New Supply	Consumption: Tons	Consumption: % to Crude [a]	Exports	Stocks On Hand at End of Period
1941	**274,202**	**251,231**	**32.2**	**13,851**	**41,750**
1942	**286,007** [b]	**254,820**	**64.6**	**30,405**	**42,532**
1943	**304,058** [c]	**291,082**	**59.6**	**15,678**	**46,201**
1944	**260,631** [d]	**251,083**	**35.3**	**11,800**	**43,832**
1945	**243,309**	**241,036**	**30.2**	**13,413**	**28,155**
1946	**295,612**	**275,410**	**26.5**	**14,461**	**33,666**
1947	**291,395**	**288,395**	**24.8**	**14,556**	**35,943**
1948	**266,861**	**261,113**	**24.4**	**11,428**	**32,630**
1949	**224,029**	**226,679**	**22.5**	**10,637**	**28,263**
1950	**314,008**	**303,733**	**24.1**	**11,740**	**35,708**
1951	**366,700**	**346,121**	**26.6**	**14,722**	**45,082**
1952	**274,981**	**280,002**	**22.2**	**11,180**	**30,664**
1953	**298,336**	**285,050**	**21.3**	**11,597**	**32,319**
1954	**258,101**	**249,049**	**20.2**	**10,232**	**30,746**
1955	326,649	312,781	20.4	13,988	31,498
1956	287,220	270,547	18.8	13,832	34,969
1956:					
Jan.	26,205	25,827	19.6	1,382	31,640
Feb.	27,108	25,571	20.3	1,115	31,875
Mar.	28,468	26,176	20.3	1,163	33,326
Apr.	26,933	23,999	19.6	1,179	34,360
May	25,485	23,560	18.9	1,297	34,863
June	22,153	20,049	18.4	1,264	35,647
July	19,776	18,099	18.7	952	35,703
Aug.	21,724	21,498	18.0	1,076	35,512
Sept.	22,368	20,242	17.9	1,015	36,527
Oct.	26,318	23,946	17.8	1,298	37,904
Nov.	20,009	20,832	18.2	1,189	36,063
Dec.	20,673	20,737	17.7	902	34,969
1957:					
Jan.	25,103	24,053	17.5	1,288	34,552

Source: U. S. Department of Commerce.
Notes: (1) These figures are revised from time to time and the latest available issue should be consulted for the most accurate data. [a] Includes natural and synthetic rubber. [b] Includes 893 tons of imports. [c] Includes 67 tons of imports. [d] Includes 21 tons of imports.

Cotton, Rayon and Nylon Tire Fabrics

(In Thousands of Pounds)

	Production: Rayon Tire Cord Not Woven	Production: Rayon Tire Cord Woven	Production: Cotton and Nylon Cord & Fabric [a]	Production: Chafer Fabrics (all fibers)	Production: Total Tire Cord and Fabric	Stocks [b]: Cotton and Nylon Cord & Fabric	Stocks [b]: Rayon Cord and Fabric
1955:							
Jan.-Mar.	**20,299**	**79,191**	**14,870**	**12,763**	**127,123**	**6,863**	**44,239**
Apr.-June	**21,550**	**81,036**	**18,898**	**12,724**	**134,208**	**8,870**	**40,689**
July-Sept.	**20,740**	**81,996**	**16,093**	**12,941**	**131,770**	**9,679**	**47,272**
Oct.-Dec.	**24,343**	**77,600**	**15,754**	**12,333**	**130,030**	**9,182**	**46,636**
Total	86,932	319,823	65,615	50,761	523,131	34,594	178,836
1956:							
Jan.-Mar.	23,707	74,833	29,298	14,176	129,199	10,185	48,936
Apr.-June	21,557	60,644	28,752	11,628	112,546	10,433	43,737
July-Sept.	18,698	56,961	26,349	7,958	102,575	11,094	44,376
Oct.-Dec.	20,071	55,639	28,515	9,497	104,927	12,500	38,060
Total	84,033	248,077	112,914	43,259	449,247	44,212	175,109

Source: Bureau of the Census, U. S. Department of Commerce.
Notes: (a) Combined to avoid disclosing figures for individual companies. (b) At end of period.

Gasoline Consumption

(In Thousands of Barrels of 42 Gallons)

	1950	1951	1952	1953	1954	1955	1956
Jan.	66,981	80,670	86,863	89,634	89,852	96,397	100,642
Feb.	53,274	72,864	82,043	86,458	86,206	88,464	98,088
Mar.	78,780	86,962	87,065	98,158	101,549	105,684	113,128
Apr.	80,350	87,573	98,563	102,044	103,866	111,116	113,034
May	89,035	100,266	101,137	105,918	104,418	115,707	124,114
June	90,174	96,364	99,305	114,703	113,037	120,710	127,413
July	91,677	100,567	105,307	112,960	112,231	115,653	121,243
Aug.	94,507	101,453	102,954	109,124	110,223	121,816	126,207
Sept.	86,725	91,891	100,095	106,158	104,706	113,379	112,691
Oct.	89,067	100,209	103,689	106,037	105,607	112,558	120,133
Nov.	82,688	88,581	91,326	99,210	102,393	109,212	112,636
Dec.	81,032	84,551	95,817	100,225	104,258	111,034	108,215
Total	994,290	1,091,951	1,154,254	1,230,629	1,238,346	1,321,730	1,377,544

Source: U. S. Bureau of Mines.

U. S. Gross Imports of Balata, Jelutong, Gutta-Percha, etc.

(All Quantities in Long Tons)

Year	Balata: Tons	Balata: Value	Jelutong: Tons	Jelutong: Value	Gutta-Percha & Other Guttas: Tons	Gutta-Percha & Other Guttas: Value
1945	**1,361**	**907,253**	....	.....	**36**	**21,970**
1946	**2,281**	**2,233,065**	**304**	**256,169**	**423**	**458,064**
1947	**1,982**	**2,276,531**	**2,878**	**1,496,887**	**392**	**779,591**
1948	**1,195**	**805,078**	**3,401**	**2,377,765**	**423**	**542,788**
1949	**1,391**	**814,554**	**1,043**	**834,978**	**197**	**189,021**
1950	**2,117**	**1,589,885**	**1,789**	**1,515,162**	**541**	**745,418**
1951	**2,452**	**1,973,271**	**1,669**	**2,608,359**	**383**	**430,539**
1952	**988**	**762,994**	**1,636**	**2,094,983**	**282**	**385,890**
1953	**1,619**	**866,248**	**1,027**	**1,166,837**	**235**	**303,116**
1954	**949**	**504,065**	**2,196**	**2,624,926**	**417**	**511,055**
1955	1,022	967,369	1,679	1,731,821	284	318,115
1956	1,396	1,111,165	1,851	1,909,447	290	309,615
1956:						
Mar.	164	116,302	135	123,366	17	21,620
Apr.	93	62,425	111	105,593	34	48,766
May	31	22,595	152	159,121	33	34,803
June	99	78,150	248	243,307	15	14,008
July	46	53,177	147	152,950	13	31,774
Aug.	76	89,476	212	225,769	18	21,499
Sept.	195	165,793	103	127,682	5	10,199
Oct.	232	181,337	158	155,523	23	19,254
Nov.	232	194,511	116	144,945	74	45,853
Dec.	111	58,952	217	234,224	38	30,131
1957:						
Jan.	38	17,911	141	155,467	15	10,684

Source: U. S. Department of Commerce.

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100 Ton, Watson-Stillman, Platens 13" x 13", Ram 3½" x 3" Str., MD Pump
100 Ton, Watson-Stillman, 4-Post, Platens 11¾" x 12", Ram 8" x 15" Str
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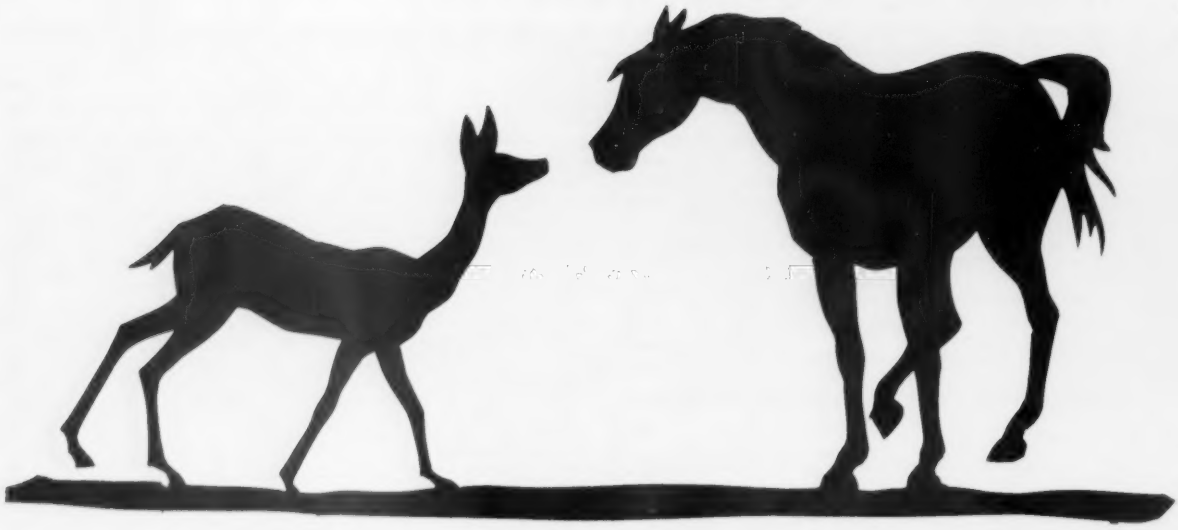

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